Mining CONGRESS JOURNAL

THE AMERICAN MINING CONGRESS

MARCH 1945

Carloads of Power

AT THE FACE

. . . where you need it most . . . delivered quickly and economically . . . over your regular haulage system, by this 3-car Portable Ignitron Rectifier train. Direct-current power to drive cutting machines, loaders, locomotives, etc.—without the voltage drop and power loss from long feeder lines.

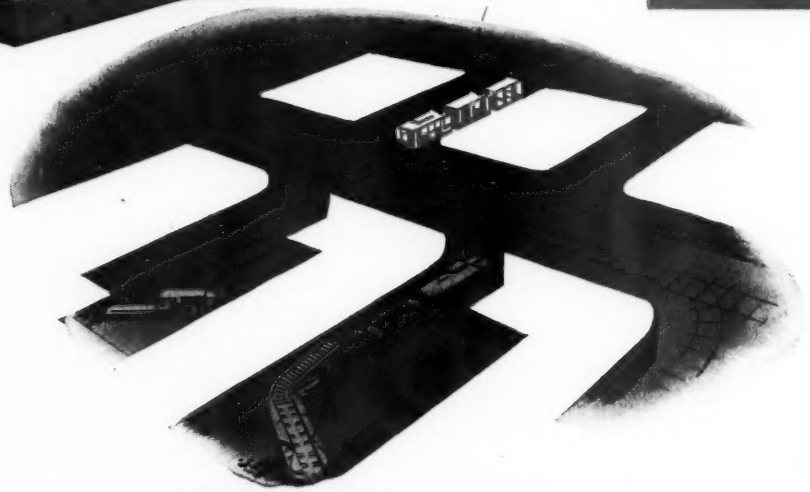
. . . an exclusive Westinghouse development, the Ignitron Rectifier train actually provides a power substation near the face. The modern, light, compact Type ASL Air-cooled Transformer, built into this equipment, contains no inflammable or toxic liquids to leak or cause damage. Inerteen type transformer, if desired. Choice of pumped or sealed-tube Ignitron.

. . . the extreme flexibility, rugged construction and economy of operation has resulted in widespread acceptance of this equipment by the coal mining industry—units are in service in all of the important coal producing areas. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., Dept. 7-N.

J-94630

3-CAR PACKAGED POWER

Car No. 1—all the a-c equipment
Car No. 2—the transformer
Car No. 3—the Ignitron Rectifier and the d-c equipment



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

ELECTRICAL EQUIPMENT FOR THE MINING INDUSTRY

Mining CONGRESS JOURNAL

VOLUME 31, NUMBER 3 — FOR MARCH 1945

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★ ★ ★

FRONT COVER: Manpower for mines must be of the best quality available if the war effort is not to be impaired. Here is a Saturday payroll line-up at Bishop, W. Va.
Hamilton Wright Photo

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress.

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HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — LOUIS S. CATES, *Vice President* — JAMES D. FRANCIS, *Vice President* — JULIAN D. CONOVER, *Secretary*

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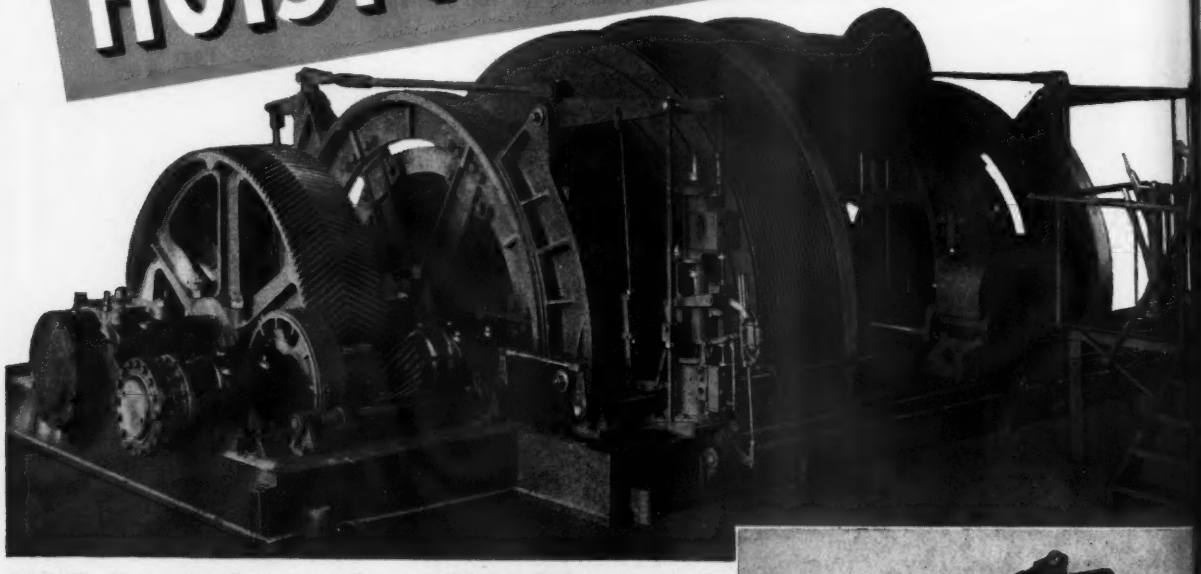
Member, Audit Bureau of Circulations

LEHIGH NAVIGATION COAL COMPANY BOOSTS OUTPUT ONE-THIRD IN 1943

Establishing a new anthracite production record, the workers of the Lehigh Navigation Coal Company in the Panther Creek Valley of Pennsylvania, produced one-third more coal in 1943 than in 1942. Total commercial production in 1943 was 4,092,820

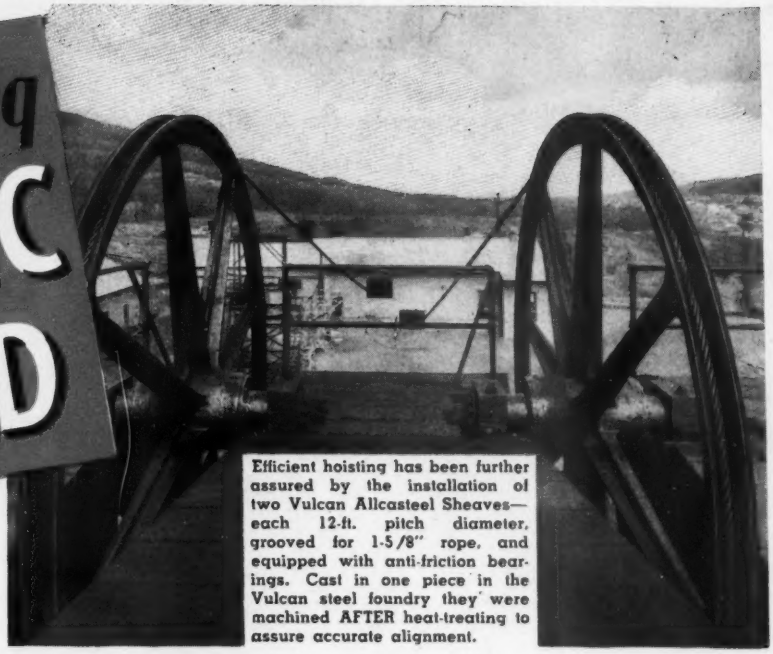
THEN..."Navigation" took another step forwa the MOST POWERFUL E HOIST IN THE ANTHRAIT



ABOVE: Navigation hoist partially assembled in Vulcan erecting shop before being taken down for shipment. Gear guards not installed. Experienced mining men will recognize the powerful air-operated brake engines and (immediately in front of operator) the Vulcan Safety Devices which provide dependable protection against over-winding, over-speeding, power-failure or mistakes of any kind on the part of the operator. In any of these events the hoist stops—quickly but smoothly—and cannot be started again until normal conditions have been restored.

AT RIGHT: Rear view of hoist showing positive toothed-type clutch with air-operated clutch engine and parallel-motion post-type brake with pressure-graduating rig. The latter is an exclusive Vulcan feature which permits smaller initial clearance between brake-shoe and drum without danger of dragging and assures smoother, more uniform braking action than would otherwise be possible.

...ward by installing ...ELECTRIC ...ITE FIELD



Efficient hoisting has been further assured by the installation of two Vulcan Allcasteel Sheaves—each 12-ft. pitch diameter, grooved for 1-5/8" rope, and equipped with anti-friction bearings. Cast in one piece in the Vulcan steel foundry they were machined AFTER heat-treating to assure accurate alignment.

WHEN war-time needs for other fuels increased the demand for anthracite far beyond that of any other recent period the Lehigh Navigation Coal Company was ready—with completed improvements, above and below ground, which enabled a loyal working force to increase its 1943 output over that of 1942 by more than a million tons.

Then "Navigation" took another big step forward by installing the most powerful electric hoist in the anthracite field, so that even greater production could be secured from its famous Coaldale Colliery. Powered by a 1750 hp. motor, its cylindro-conical tight-and-loose drums are 9 to 15 ft. in diameter—each drum grooved to stow 1676 ft. of 1-5/8" rope. We appreciate and gratefully acknowledge the opportunity afforded us to cooperate with the engineering executives of the Lehigh Navigation Coal Company in the design and manufacture of this great hoist and thereby to increase, importantly, our own contribution toward the winning of the war.

Write us regarding any heavy-duty hoisting requirement that will aid the war effort. Hundreds of successful installations throughout the United States and many other countries enable Vulcan engineers to make helpful suggestions—without charge or obligation of any kind.

VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

Heavy-Duty Electric Hoists
Self-Contained Hoists
Scraper Hoists
Car-Spotting Hoists
Room Hoists

Shaking-Chute Conveyors
Chain Conveyors
Cast-Steel Sheaves and Gears
Cages, Skips and Gunboats
Coal-Preparation Equipment

Steam Locomotives
Diesel Locomotives
geared and electric drive
Gasoline Locomotives
geared and electric drive

Load-Carrying Larries
Rotary Kilns, Coolers and Dryers
Crushing Rolls and Pulverizers
Briquetting Machines
Ball, Rod and Tube Mills

Courtesy Goodman Manufacturing Company

HOMOCORD and other MANHATTAN CONVEYOR BELTS . . . give you greater tonnage and longer life in underground workings

Homocord Conveyor Belt

Engineered Homocord Strength Members grouped to give great tension strength are sealed-in with moisture-proof FLEXLASTICS* and mildew-proofed to provide added protection from dampness in mine-workings, cushion feeding impact, reduce hazards of puncture, increase flexibility for perfect troughing, and decrease inelastic stretch. Homocord is the first and only conveyor belt possessing the virtues of a cord belt, but with the strength and ability to hold metal fasteners. Tough wear-resisting cover provides protection from abrasion and puncture.

Other MANHATTAN Conveyor Belts for underground service . . . Made with FLEXLASTICS* and specially designed Strength Members to distribute load strains uniformly. Longitudinal and transverse flexibility provides power-economy, traction and easy troughing. Compensated to equalize ply-stresses over small pulleys.

All MANHATTAN Conveyor Belts are mildew-proofed for underground service, and are oil-proofed where needed.

ADVANTAGES of HOMOCORD CONVEYOR BELTS

1. Complete bonding of every member into a homogeneous structure.
2. Holds metal fasteners.
3. Lateral flexibility permits perfect troughing, accurate training, reduces fatigue of flexing at bend in troughing idlers.
4. Resists destructive action of continuous or heavy impact feeding.
5. Cushion Homocord body and low inelastic stretch reduce wear and tear of top cover.
6. Homocord body reduces hazard of punctures.
7. Homocords so completely encased in Flexlastics, moisture not admitted, mildew cannot start.
8. Longer life, lower cost per ton.

The term FLEXLASTICS is an exclusive MANHATTAN trade mark. Only MANHATTAN can make FLEXLASTICS.

ARMY E NAVY

RM

THE MANHATTAN RUBBER MANUFACTURING DIVISION
OF RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSEY

Here's news . . . the entire line of Du Pont Instantaneous and Delay Electric Blasting Caps is now equipped with nylon-insulated wires and rubber plug closures. These outstanding improvements make Du Pont Electric Blasting Caps better and safer than ever:

1. Nylon-Insulated Wires—Reduce misfires resulting from current leakage. Vivid contrasting colors increase visibility . . . minimize the possibility of error in hooking up.

2. Rubber Plug Closures—Assure maximum water resistance . . . permit use of shorter cap shells . . . make priming easier, safer.

These improvements, products of Du Pont research, represent the greatest advance in electric blasting caps in half a century. Your Du Pont Explosives representative will gladly show you samples of these new caps. Be sure to see them.

E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

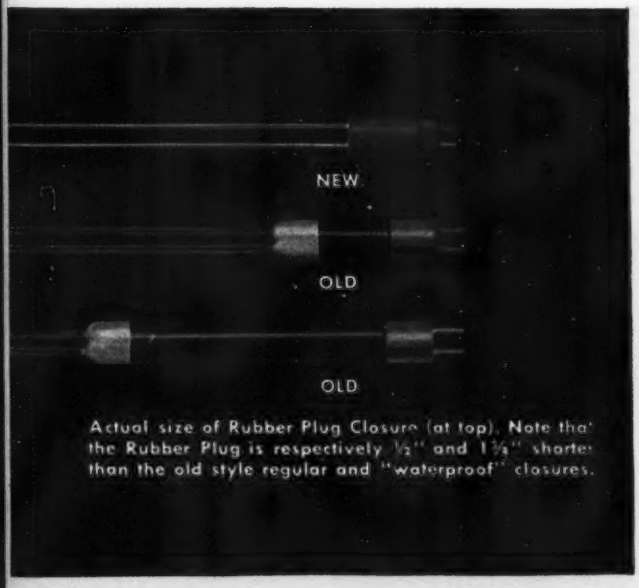
DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

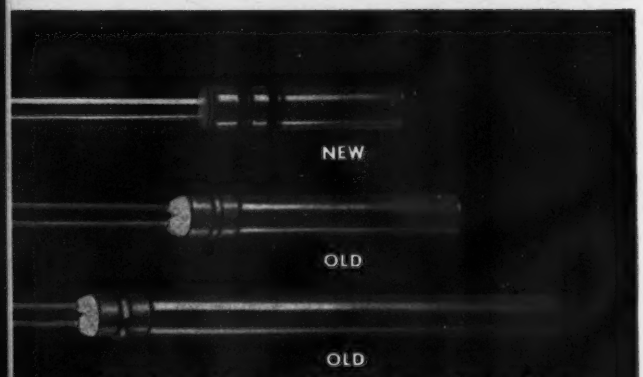
DU PONT

REG. U.S. PAT. OFF.

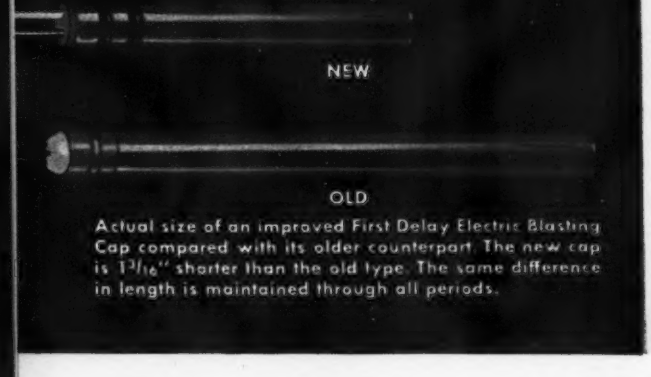
These exclusive features . . .



Actual size of Rubber Plug Closure (at top). Note that the Rubber Plug is respectively ½" and 1⅛" shorter than the old style regular and "waterproof" closures.



Actual size of improved Instantaneous Electric Blasting Cap (at top) compared with old type regular and "waterproof" caps (center and bottom.) The new cap is shorter by ½" and 1⅛" respectively.



Actual size of an improved First Delay Electric Blasting Cap compared with its older counterpart. The new cap is 1 3/16" shorter than the old type. The same difference in length is maintained through all periods.

make Du Pont Electric Blasting Caps safer and better

● Today, when increased production is so vital to the war effort, two important improvements in Du Pont Electric Blasting Caps are helping industry do the job faster and safer. Here are the details:

Nylon-Insulated Wires—Nylon plastic wire covering is tough and abrasion-resistant . . . and it is not affected by extreme or rapid changes in temperature. It is equal to enamel insulation in preventing current leakage . . . yet, when necessary, it is readily removed for making connections. Nylon-insulated wires are clean to handle and resist kinking. Brilliant colors make them easy to see.

Rubber Plug Closures—These plugs, double crimped in the shells, replace the former combination of bridge plug, asphaltic waterproofing compound and sulfur seal. This allows a substantial reduction in shell length without any reduction in explosive strength. Shorter shells make priming easier and the loading of primers safer. Rubber plug caps have far greater water resistance than old style, asphalt-sealed "waterproof" caps . . . and their performance is not affected by extremes of temperature.

These exclusive features make Du Pont Electric Blasting Caps more dependable than ever. *And the most dependable detonators are the safest detonators.* So don't run the risk of misfires . . . use Du Pont Caps.

E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

• • •

Note: Nylon and rubber are allocated for the above described purposes by the War Production Board.

DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

DU PONT
REG. U.S. PAT. OFF.

POWER

EXIDES AND SHUTTLECARS — THE TEAM THAT KEEPS PRODUCTION AT ITS PEAK

WITH flexible, Exide-powered shuttlecars on the job, coal moves faster and smoother from loaders to the main line. Car change time is cut to seconds, loaders are kept busy and, as production is speeded up, haulage costs come down.

Exide Batteries are designed to meet the higher motive-power needs in today's mechanized mines. They have ample power for prompt starting under heavy load, and for assuring sustained speeds throughout each shift.

When shuttlecars, locomotives and trammers are powered by Exides, you can count on battery dependability, long-life and ease of maintenance.

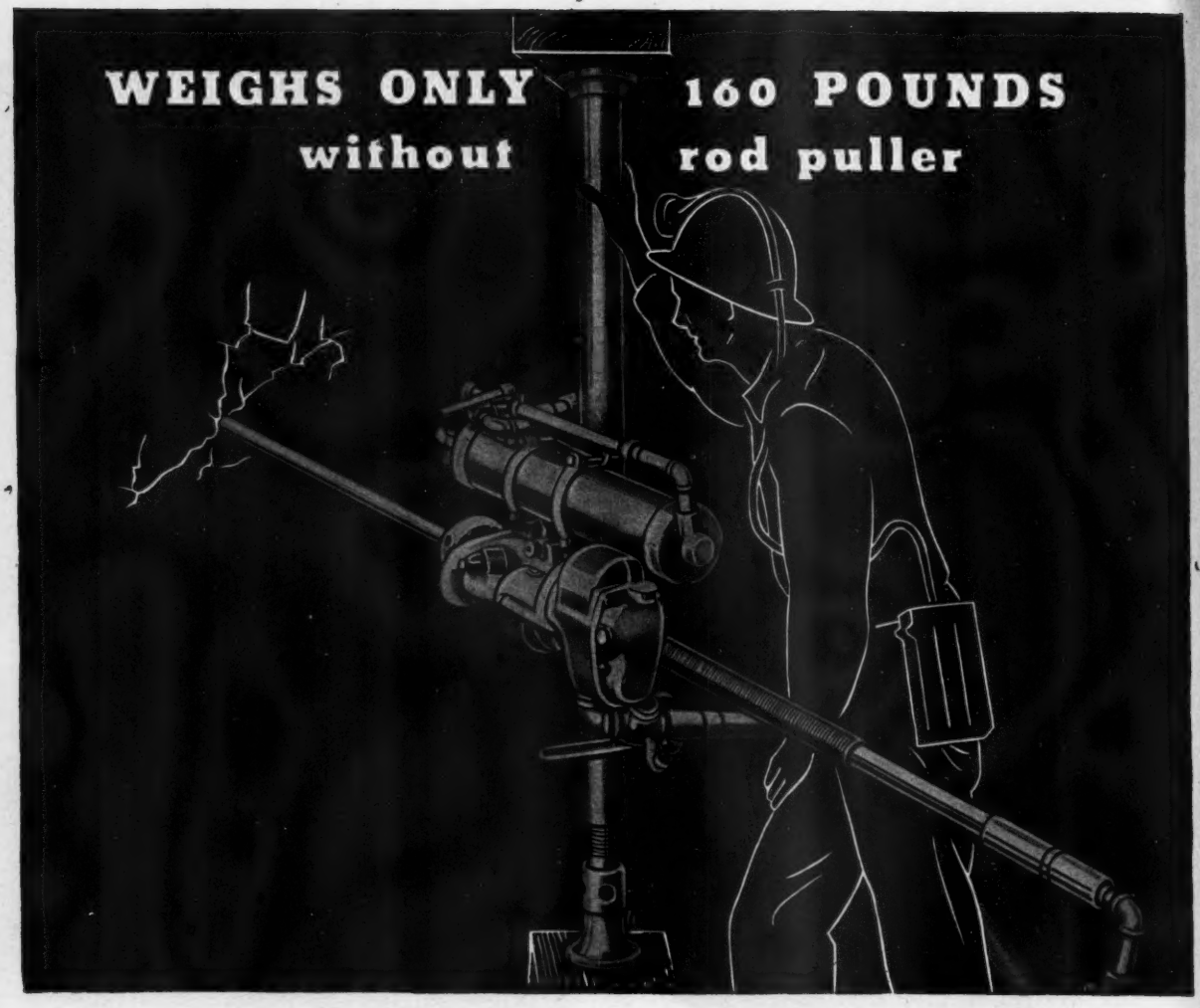
If you wish more detailed information or have a special battery maintenance problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

ARMY E NAVY

Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto



CP No. 5 DIAMOND DRILL

LIGHTER and more compact than any other diamond drill of equal capacity — measuring only 42½ inches overall — the CP No. 5 Diamond Drill can be operated at bit speeds up to 2500 R.P.M. with stepless throttle regulation! CP No. 5 mounts like a drifter on any rock drill saddle, works in any position from a column, arm or crossbar. Ideal for underground prospecting — 500 foot capacity with E-EX Fittings, or equally efficient in "blast hole" drilling. Greater footage per shift and lower drilling costs result from balanced design, smooth rotary power and minimum rod vibration. Write for data.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

regardless of Job...

TRU-LAY HAS THE STAMINA

When it comes to efficient, economical, safe operation, American Cable **TRU-LAY PREFORMED WIRE ROPE** is without a peer. It is head and shoulders above any non-preformed rope because, being preformed, **TRU-LAY** is easier and safer to handle, is pre-broken-in, reeves faster. It resists kinking and whipping, requires no seizing when cut, splices and sockets easier and with greater dependability. American Cable **TRU-LAY** is the original preformed rope. Make certain your next line is **TRU-LAY PREFORMED.**

• Send today for a free copy of American Cable's 80-page, pocket-size book: "HOW TO KEEP YOUR WIRE ROPE WORKING." One of the most constructive books on wire rope maintenance ever published. A real help for your operators regardless of brand of rope now being used.

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AMERICAN CHAIN & CABLE • BRIDGEPORT

For use where entries are narrow

JOY FOUR WHEEL DRIVE AND FOUR WHEEL STEER SHUTTLE CAR

In many operations, more efficient mining could be conducted and economies effected by use of Joy Shuttle Cars . . . but operators hesitate to investigate this system of low-cost haulage because they fear that Joy Shuttle Cars could not negotiate the narrow turns in their room entries. Here's our answer to that . . . a specially built four wheel drive—four wheel steer Joy Shuttle Car.

This car has adequate capacity for quantity haulage in all types of mines. It is equipped with the latest type simplified wheel articulation design which has been thoroughly proved by use in Army Trucks and Heavy Duty Distribution Units. The Joy 5-SC is also provided with conveyor bottoms for utmost speed in loading and discharging cargo.

Joy Loaders are Perfect Team-mates for Shuttle Cars

Joy 11 Bu. Loader

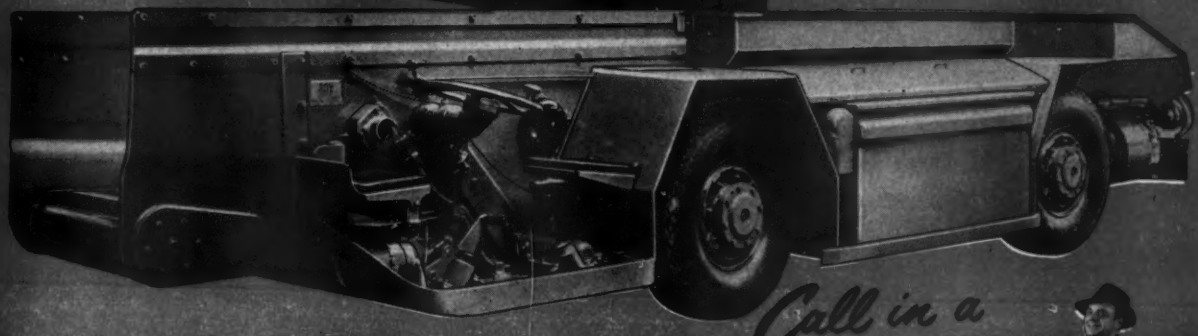
Designed for closely coordinated, fast quantity loading in all types of mines, Joy Loaders are sturdily built for maximum production. Powerful claw type gathering arms handle the biggest lumps and the smallest with equal ease. Self-articulating patented chain conveyor can be swung 45° at the head for more efficient loading into Joy Shuttle Cars or into conveyors.

JOY 5-SC
SHUTTLE CAR HAS THE FOUR WHEEL STEER FEATURE

Turning in a minimum outside clearance radius of 18' 5" this shuttle car of 5 to 8 ton capacity, will clear any pillar or room wall which has a 12' radius. The Joy four wheel steering works as smoothly and easily as the conventional type with finger-tip controls that can be reversed.

JOY 5-SC
HAS THE FOUR WHEEL DRIVE FEATURE

Made with an 8' wheel base, this particular Joy Shuttle Car may be equipped with sideboards to increase its load. When motivated by cable reel, the 5-SC model can be supplied with a hydraulically elevated discharge end for discharging into mine cars if needed. Designed specifically for use in narrow room work, it provides maximum traction for travel over bad bottoms.



Call in a Joy Engineer

Joy 14 Bu. Loader

JOY
MANUFACTURING CO.
FRANKLIN, PA.

Announcing A NEW PORTABLE

Underground A-C Power

WHERE you want it... WHEN you want it

The low height (42 in.) and ready mobility of the new G-E portable a-c unit substation make it an important addition to G.E.'s line of portable substations. Here are some of the important design features of the new unit:

1. **All-welded, steel transformer tank is completely sealed and pressure-tested before leaving the factory. The all-metal enclosure is safely grounded, and easy to keep clean. There are no dust-collecting air ducts.**
2. **Primary junction box includes solderless connectors. Where desired, three gang-operated, oil-filled cutouts can be supplied (for circuits below 5000 volts).**
3. **Removable plate gives ready access to handle of ratio adjuster, for easy and safe changing of taps when the transformer is "dead."**
4. **Cable stuffing boxes permit cables to be clamped in place, and prevent dust and water from entering air-circuit-breaker compartment.**
5. **Outdoor-type dustproof and weatherproof air-circuit-breaker compartment provides ample protection for both underground and outdoor service.**
6. **Air circuit breakers for low-voltage feeders. They are rated for 15,000-amp interrupting capacity and include thermal time trip and instantaneous high-current trip.**
7. **Low-voltage receptacles and plugs can be supplied for circuits of 200 amp and less when specified.**
8. **Transformer section is filled with Pyranol*—General Electric's nonsludging cooling and insulating liquid that will not burn.**
9. **Skid-type base, with protective bumper. The substation can be mounted on wheels to fit any track gage used in mines.**

*Trade-mark Reg. U.S. Pat. Off.

UNIT SUBSTATION TO KEEP A-C MOTOR SPEEDS UP AND COPPER COST DOWN

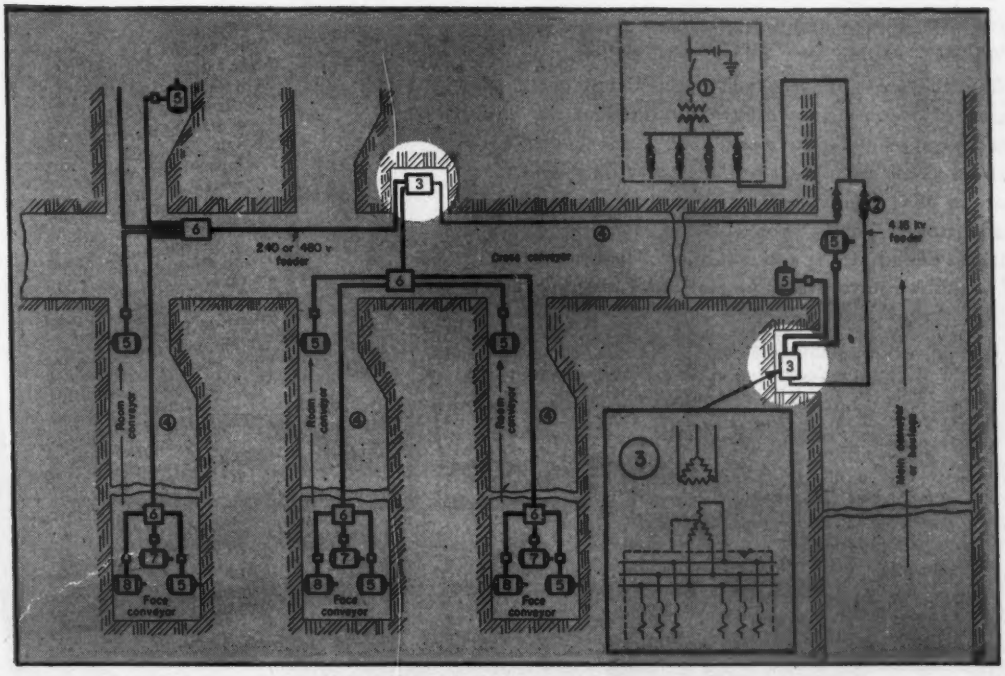
NOW IT IS EASIER than ever before to run your high-voltage a-c feeders right up close to the working face. It is easier to cut down the length of your heavy, costly low-voltage secondaries. It is easier to eliminate the voltage drop which slows down machines and production.

This new, *complete* G-E unit substation was specially designed for modern a-c mine service—to make it a simple, practical matter to keep moving your transformer in as new rooms are developed. It is surprisingly compact (only 42 inches high!). It is readily portable.

The new G-E unit is designed around Pyranol transformer sections for maximum safety. It is completely metal enclosed, mounted on skids (or wheels if required), and includes all the necessary components for handling 2400- to 7200-volt incoming lines and outgoing low-voltage feeders of 600 volts or less. All electrical and mechanical components are *fully co-ordinated* by one manufacturer, assuring you of long, dependable service.

The typical plan below shows how this new unit substation can be used to supply power to conveyors, fans, drills, pumps, loading machines, cutters, and other a-c mining machinery. For adaptation to your electrical layout, you'll want detailed information on sizes, weights and dimensions, and technical data on equipment and ratings. Write today for Bulletin GEA-4301.

General Electric Company, Schenectady 5, N. Y.



Typical a-c mine distribution system, showing how the new G-E low-height, portable, mine-type, a-c unit substation can bring high-voltage primary power closer to the working face. (1) Master unit substation at entrance to mine (2) Sectionalizing circuit breakers (3) New G-E PORTABLE A-C UNIT SUBSTATION (4) Mine-type cable (5) Conveyor drives (6) Low-voltage distribution box (7) Loader drive (8) Cutter drive

Buy all the BONDS you can—*and keep all you buy*

GENERAL ELECTRIC

Why Cleveland Power Feed Drifters give *Peak Performance!*

CLEVELAND PD24 DRIFTER

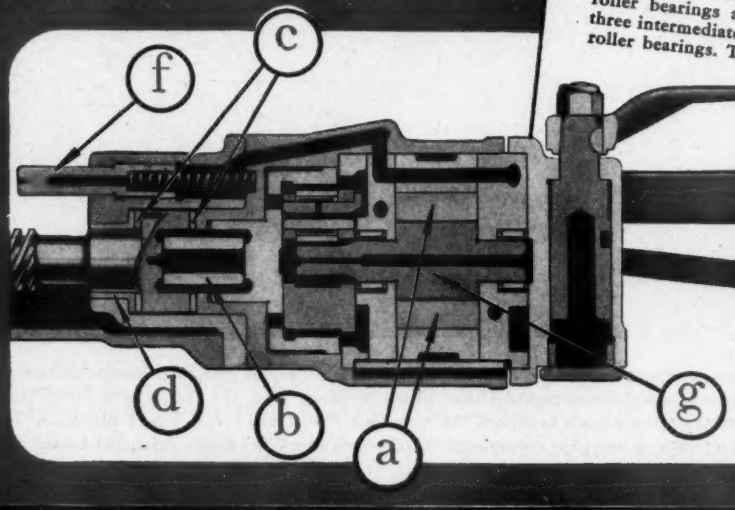
● In the first place, the Cleveland Drifter hammer motor is efficiently designed and finely made. The honed cylinder insures less wear—longer life, with maintained efficiency. Hammer and rifle bar flutes are ground, reducing friction and binding. Splined chuck jaw can take 14 different positions in its relationship to chuck bushing, resulting in longer life of the latter. Oil channels in rifle bar insure proper lubrication of this important part. Pentrating prevents rust, and reduces friction between moving surfaces. Skillful heat treating "armor plates" parts against breakage from fatigue and shock.

Then there's the power feed mechanism, a sectional view of which is shown here. Mounted at the end of the guide shell, this mechanism is not affected by direct shock from the hammer motor. The controls are in easy reach of the operator at all points of feed travel. Power feed automatically moves the drifter ahead at a speed suitable for fastest cutting. The quick return promotes fast steel changes, and the drill runner can keep up a rapid pace all through the shift without undue fatigue.

All these good features of Cleveland Power Feed Drifters contribute to their peak performance.

Ask us to send BULLETIN 127

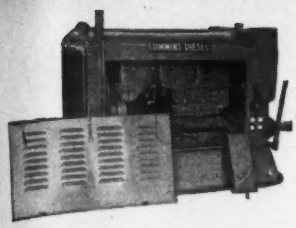
THE motor being of the vane driven, double-lobe type, power is applied at diametrically opposite points of the rotor, insuring more power delivered and more nearly constant torque. The motor vanes (a) are thrust outwardly against the cylinder walls by air during the whole of the power sectors, resulting in more power with less air used for the feeding function. "Floating joint" (b), prevents transmission to the motor of any shock or vibration coming from the feed screw of the drill. An exclusive feature is the automatic shut-off valve (f). When the drill, in returning, contacts the plunger, air to the feed motor is automatically shut off, avoiding collision of the parts at the end of the rearward travel. The one-piece rotor (g) is carried on roller bearings at both ends, and the three intermediate gears also operate on roller bearings. The thrust washers (c) and bearing bushing (d) are easily and economically renewable.



Speed Final Victory
BUY MORE WAR BONDS!

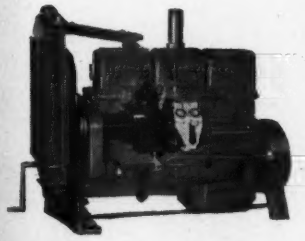
THE CLEVELAND ROCK DRILL CO.

Division of The Cleveland Pneumatic Tool Co. · Cleveland 5, Ohio



Model H Cummins Diesel is offered in both four and six-cylinder arrangements, developing maximum output of 100 and 150 hp., respectively. This engine is manufactured in a complete line of industrial and automotive models, such as the Model HP-600 power unit, shown above, and Model HBI-600, right, for wheel or track-mounted equipment.

☆ ☆ ☆



The Model HIP-600 is an open type power unit incorporating the same basic engine as that described above. It has a 4⅞" bore and 6" stroke, the six-cylinder unit having a piston displacement of 672 cu. in., and the four-cylinder, 448 cu. in.

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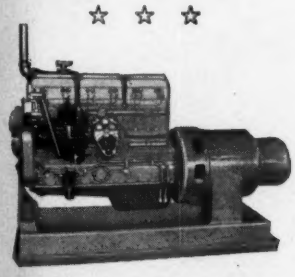

The Model HGA-601 is an AC generating set, rated 50 kw. at 1200 rpm. The four-cylinder Model H generating set is rated 30 kw. at 1200 rpm. Both four and six-cylinder sets are also available for DC operations.

A look at the Cummins Diesel's long record of profitable, dependable performance in all types of mining applications proves that—in this industry—one diesel does the complete job! In both open pit and shaft operations . . . in heavy-duty trucks, shovels, cranes, draglines and locomotives . . . in the widest variety of portable and stationary applications . . . Cummins Diesel power has consistently demonstrated its ability to get the job done in less time . . . at a lower cost.
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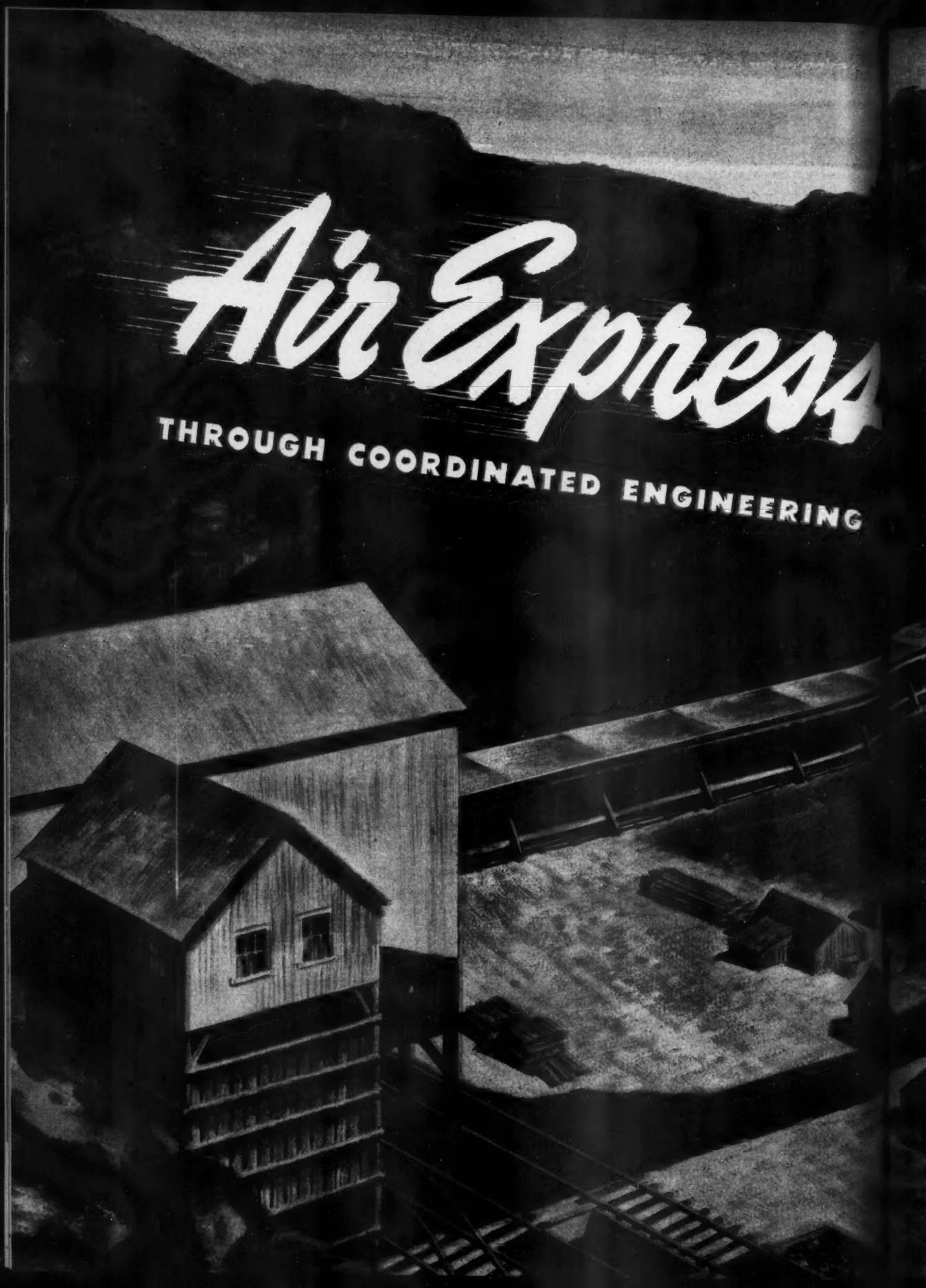
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An aerial short-cut to get coal from a hillside surge bin to a tipple, 594 feet distant across a valley, was decided on by the engineers in charge of operations at this Kentucky mine.

In planning this unusual installation, they called in designers of mechanical equipment and also United States Rubber belting engineers.

This three-way team worked together in developing a suspended conveyor system which has proved highly successful.

The 48-inch U. S. Rubber Belt installed was specifically engineered for the job. In descending from the mine to preparation plant it develops power which is returned to the line.

Coordinating efforts with those of mine operators and equipment manufacturers is the rule with United States Rubber Company technicians on all conveyor belt installations. Broad experience in fabricating all types of belts, enables them to give you the expert service such important equipment deserves.

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● Here is a simplified list of permissible explosives. From it you can choose the right one for every blasting requirement in coal mines.

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For Rock or Fine Coal	
Red H* B	280
Collier* C	320
For Wet Work	
Hercogel* A	200
Hercogel* 2	240

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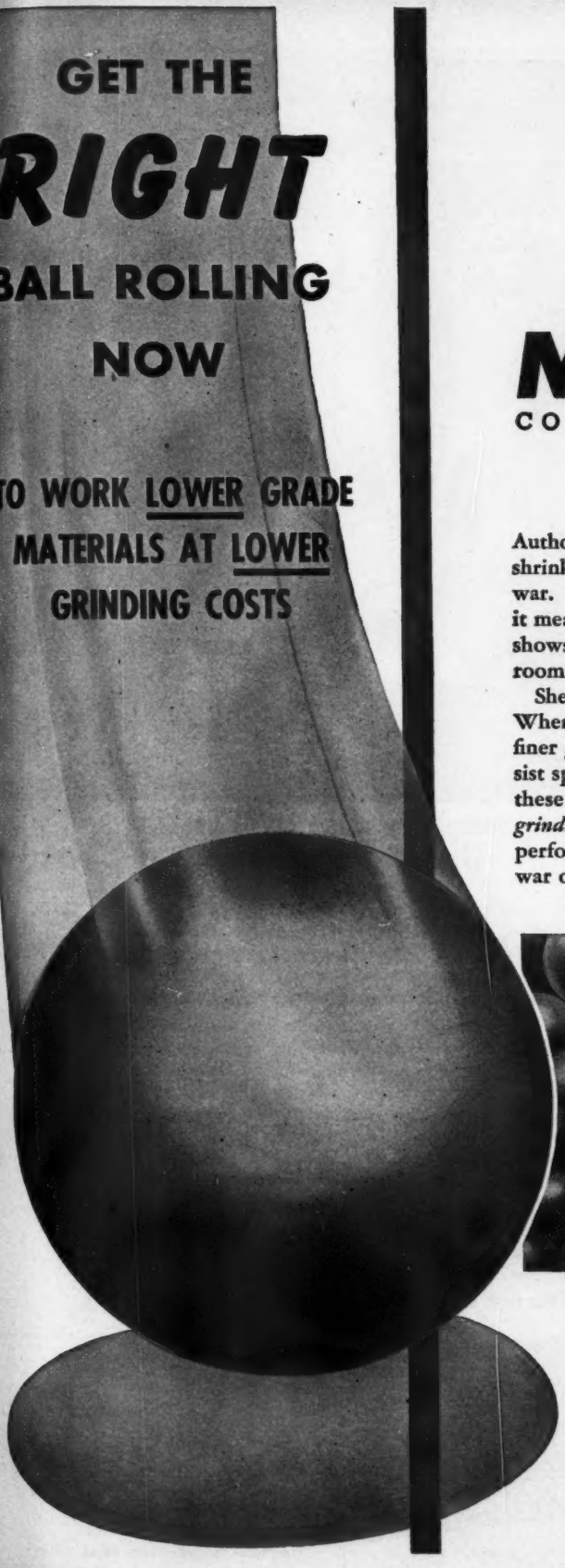

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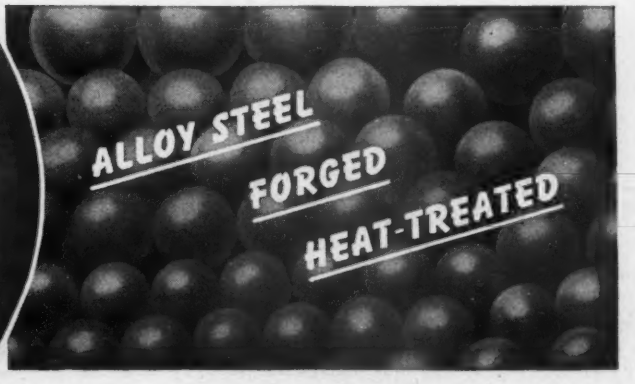
Authorities warn that orebodies of the better grade are shrinking fast, as unprecedented tonnages of metal go to war. This means working lower grade ores postwar and it means that costs must be cut in operations. Experience shows that fine grinding is the operation offering the most room for cost reduction.

Sheffield metallurgists developed a special alloy steel. When forged and heat-treated, this steel alloy produces finer grained, harder grinding balls—tough enough to resist spalling and breaking right down to the core. Today, these Moly-Cop balls are in use throughout the world—*grinding twice as many tons per ball.* Plan to prove their performance in your own mill—no need to wait for postwar operations, be ready!



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The Beginning of the End . . . Hitler's generals knew they were licked when Allied fighting men and equipment really got rolling. One reason the blitzkrieg idea blew up in their faces is the miracle of Allied supply lines—aided by an armada of the mightiest cargo-carrying trucks any army ever had. Hundreds of these huge 10-ton, 6 x 4 Macks helped chase Rommel out of Africa. Many more hundreds of them rolled into France on the heels of D-Day fighting men. When you think of Mack's record these past 44 years, perhaps it's not surprising that big *Macks* were the trucks for this big job. And it's not at all surprising that they did the job so well. Anywhere and any time—Macks really get things done.

Performance Counts!

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High Speed TROLLEY HAULAGE Keeps Tonnage Moving at Willow Grove

Smooth, one-level trolley wire and well-groomed road bed allow haulage speeds of 25 to 30 m. p. h. at Willow Grove. Although built in 1934, comparatively little maintenance is required to keep this haulageway in top operating condition.

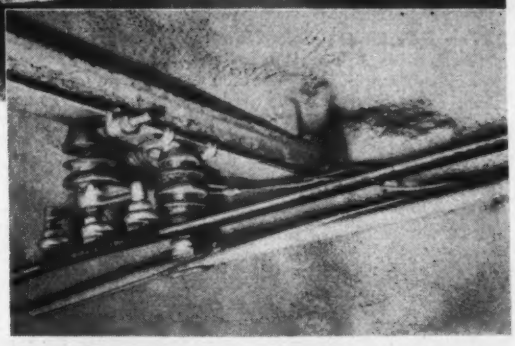
One-Level Trolley Wire Plus Well-Groomed Roadbed Bring Haulage Efficiency to Modern Hanna Property

OPERATING "round-the-clock", Hanna Coal's Willow Grove mine keeps record tonnage speeding to the tipple and into America's war machine. Because haulage speeds of 25 to 30 m. p. h. are routine, a smooth, one-level trolley wire and well-groomed road bed are absolutely essential.

At Willow Grove, O-B materials support both trolley and feeder for inside and outside haulageways. You'll find them used, too, on the power sectionalization system – Safety Feeder Switches at entries, between substations and other locations where power under heavy load must be broken; Section Insulator Switches approximately every 1500 feet along the haulage roads. Since Willow Grove standardizes on shoes for main-haul current collection, the trolley wire is conditioned at regular intervals with O-B Trolley Wire Lubricant.

That O-B products have been permitted to play an important part in this modern operation is a splendid testimonial to their ability to do a job effectively and economically. They can do the same type of job for you at your mine.

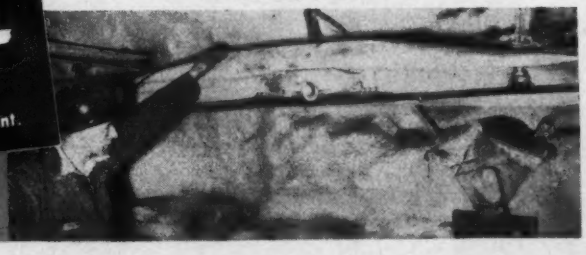
2553-M



Three Bulldog Clamps held in place lengthwise on the wire by a Triple Supporting Yoke prevent the trolley wire from kinking at curve suspension points.

The outside haul at Willow Grove rivals the inside for transportation efficiency.

O-B Section Insulator Switch and Safety Feeder Switches contribute to the well-planned sectionalization system. Trolley is guarded with rubber hood at switching points.



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WITH *Thor* DRIFTERS!

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THOR POWER-FEED DRIFTERS SPEED THE DRILLING CYCLE

1. Eliminates Hand Cranking
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3. Reduces Dead Time—Cuts Costs
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7. Extremely Low in Operating Cost
8. Speed of Feed is Semi-Automatic

POWERFUL ROTATION AND HOLE BLOWING

Stronger rotation and exceptional hole-cleaning ability are the reasons for Thor Drifters' more-footage performance and extra drilling speed.

Extra-heavy rifle bar assembly and positive-set ratchet-action, plus balanced-power piston action insures dependable rotation to deliver a fresh cut with every blow for rapid advance into the hardest rock.

The exceptional hole-cleaning ability of Thor Drifters adds still further to the penetration rate. Thor design applies a constant jet of air and water at the drill point; provides an extra blast of air when really needed to keep the hole perfectly clean at all times. Automatic lubrication—low air consumption—minimum vibration all serve to make Thor your best bet for fast, low cost drilling.

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THE INSIDE STORY OF THOR POWER-FEED!

1. POWER-FEED has an independent, balanced rotary air motor, mounted directly and rigidly on rear end of guide shell.
2. A SUBSTANTIAL PLANETARY GEARING transmits the power from rotor directly to feed screw.
3. ROTOR is perfectly aligned with feed screw by means of splined driving unit. Mechanism is free from shock and thrust.
4. BALL AND ROLLER BEARINGS throughout.
5. ENTIRE POWER-FEED UNIT is completely sealed against dirt.
6. ONE SIMPLE THROTTLE VALVE controls all feeding functions—(1) Rapid Return, (2) Neutral, (3) Slow Drilling, (4) Fast Drilling, and (5) Rapid Advance.
7. SUBSTANTIAL COIL SPRINGS mounted at each end of shell eliminate shock to drill in extreme forward or rear positions.

Thor Drifters are made in two sizes—medium or heavy duty, with hand or power feed.

For complete specifications write for catalog No. 42A.

THESE FEATURES MEAN POWER FOR SPEED IN ALL THOR DRIFTERS

MEASURED AIR—The Thor short-travel tubular valve controls air input to .00025"—positive action get full measure of power from ALL the air.

BALANCED POWER—Precise control of air input provides a full cushion of live air at both ends of piston stroke for fully balanced—full-power performance.

SMOOTH OPERATION—Every stroke is powered by the same measured quantity of air for smooth, uniform operation.

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Mining
CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress
S. A. TRENGOVE, Editor

Volume 31 MARCH, 1945 Number 3

Demands—Unlimited!

JOHN L. LEWIS has been quick to seize upon the Petrillo formula and include "Labor's Participating Royalty" as a feature of his 18 new requirements for "peace" with the coal mine operators. The total monetary value of the new demands is tremendous, presaging considerably higher prices in a market which can ill afford the risk, even though temporarily protected from competition by the incidence of war.

Coal operators express no surprise at the new burdens proposed. In fact, it is altogether probable that, in order to utterly astonish the operators (and the country) Mr. Lewis would have to acknowledge the extraordinary considerations he has already extorted and agree to abide by the rules laid down for the conduct of the normal citizen during the war. The feeling is abroad however, that Mr. Lewis is little concerned over the effects of an unbearable price level.

The royalty measure is described as a fund for "a rainy day" although it appears much more to be a device to give unparalleled power to union leaders. It will provide them with hundreds of millions to spend *that does not come from their own members.* The $60,000,000 a year from coal would ere long accumulate a tax-free reserve comparable with those of our largest savings banks and, along with similar funds in other unions, could easily rock the foundations of the whole Federal social security setup. The principle is fundamentally wrong and has no place in American industry. All productive enterprise is deeply concerned over the sinister threat thus presented.

The UMW leader contends that the "royalty" is not inflationary because operators could deduct part of the cost from their taxes and load the rest on the price to consumers. This makes one wonder *what the real definition for inflation is,* but whether or no, the consequences will be the same to the industry. When peace returns and many mines may again operate with negligible or little profit, the welfare fund would have to be absorbed chiefly in the price of coal.

It is well known that an era of the keenest competition lies ahead for the coal industry. If labor costs push prices too high, additional markets will go over to other fuels (as happened in the twenties). The miners will be the heaviest sufferers from such a contraction in coal outlet. What good are a high wage rate and improved "working conditions" without a job?

Thus we perceive the limit to demands upon coal operators. How much additional weight will be imposed is still undetermined; the load is already such as to be of undeniable assistance to competitive fuels. A continuation of this trend is seen as crippling and slowly consuming the industry itself. All of which places Mr. Lewis in a dilemma such as is always the plight of those who disdain satiation. As he calls for ever greater appeasements he merely sets the stage for elimination of the very jobs which he should, in duty, protect!

A Sharp Reminder

A REMINDER that the mining industry must be constantly on guard against moves to abolish or seriously modify present mineral land laws is found in a recent Forest Service report, "The Mining Claim Problem in the National Forests of California" by W. H. Friedhoff, which complains of certain practices said to exist in the locating of placer claims in the Forests for non-mining purposes.

After pointing to instances where timber has been cut or cabins built on mining claims, the author suggests, as the remedy for such "evils," that the present mining laws be radically altered. He would retain surface title in the United States and establish "special use permits" as to all mineral deposits in the National Forests. "The alternative," he says, "is to put all mining on the public lands under a leasing act." The report so inflates the Forest Service balloon that a little judicious pin-sticking is in order.

The National Forests were created to preserve the nation's timber supply from uneconomic depletion and not to indulge the fetish for public recreational facilities to which the Forest Service has been devoting a major portion of its energies.

The real question seems to be whether the economic resources of the Forests may be developed and put to use, or whether they are to be placed in the same category as the National Parks. Certainly the orderly cutting of timber is desirable, but to say that the minerals in these Forests should be marketed under government leasing is a very different story. Mining claims, located under existing law, have been the source of important mineral production, and during the depression years these areas afforded some subsistence to thousands of persons engaged in "sniping" gold in the old gravel channels. The fact that a properly located mining claim may subsequently yield benefit to the owners as the site for a cabin or for recreational use in no way contravenes the purpose for which the Forests were established nor is it prejudicial to the interests of the general public.

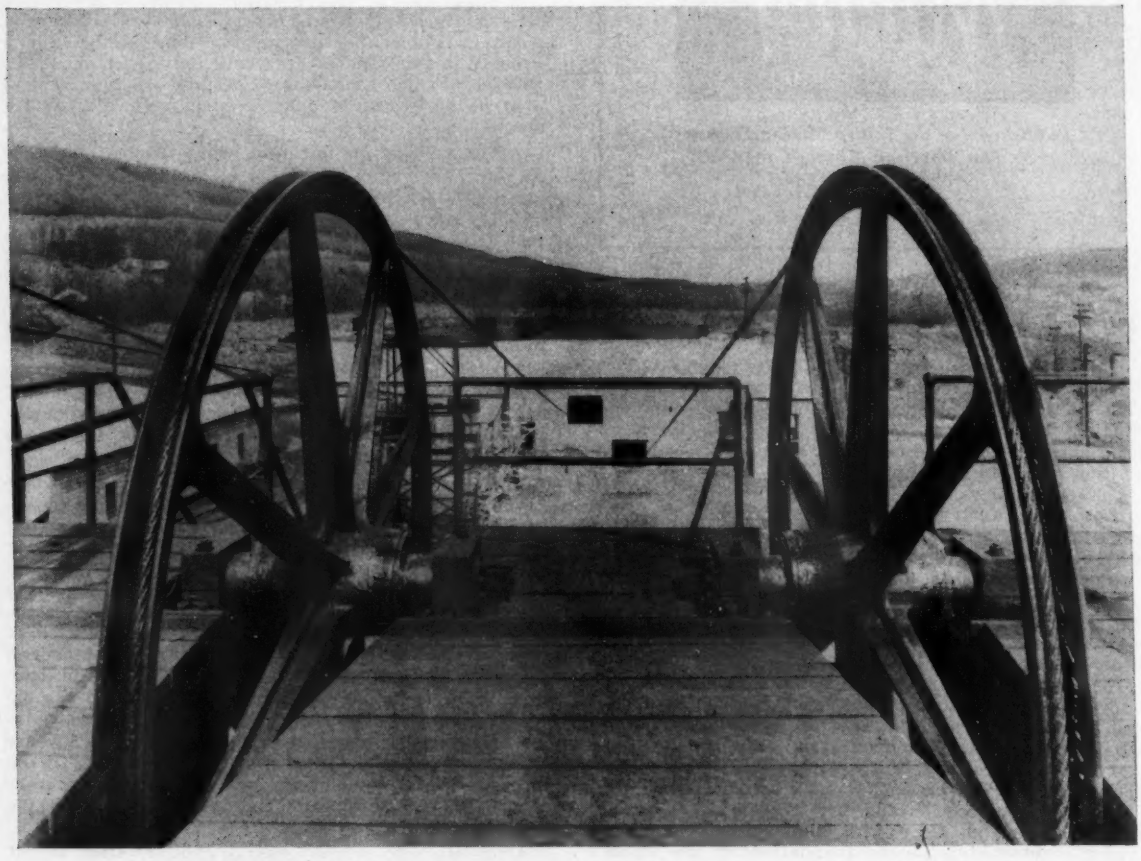
After all, who is the general public? Does it not include private owners who develop and benefit the lands in question, who pay taxes and contribute to fire protection, who build up the isolated mountain communities, as well as the itinerant motorist who camps for the night, fishes out the streams and leaves his rubbish lying around behind him?

The bureau has vigorously contested practically every application for mineral patent in forest areas, and where it could show that locations were made primarily to cut timber, it has been uniformly successful in blocking issuance of patents. It seems plain that the courts and the present laws afford ample protection for the government where real abuses exist.

We find no "remedy" in substituting leasing or special permits for the present law. It only forecasts unutterable confusion in existing mining claim titles and sounds the deathknell of any future mineral developments in these areas. Experience with mineral leasing to date permits no lesser prediction. Recent changes in the potash leasing regulations, showing how the requirements may be made progressively more burdensome by mere administrative action, and may afford a basis for socialized government control, offer a warning that cannot be escaped.

The Friedhoff report will presumably be made a part of the New Deal drive to put all new mining on a government lease basis. The mining industry must and will continue to oppose this drive with all the vigor of free men who love free enterprise.

The COALDALE HOIST



The one-piece casteel hoisting sheaves have a 12-ft. pitch diameter, are grooved for 1⅝-in. rope, and equipped with anti-friction bearings

New Electric Mine Hoist of the Lehigh Navigation Coal Company is Most Powerful in Anthracite Field. It Was Installed to Replace a 30-Year Old Steam Hoist and Will Continue in Service As Operations Go Deeper

By R. E. HOBART
Mechanical Superintendent
Lehigh Navigation Coal Company

and

J. E. BORLAND
Engineer, Mining Section
Westinghouse Electric & Manufacturing Company

★ ★ ★

THE most powerful motor-driven hoist in the anthracite field is now in service at the Coaldale Colliery of the Lehigh Navigation Coal Company, replacing a steam hoist that had seen over 30 years service. Operating at a maximum rope speed over 3,000 ft. per minute, the new hoist is also one of the highest speed a-c motor-driven mine hoists in the world.

A cross section of the coal measures through No. 7 Shaft, Coaldale Colliery, at which this hoist is installed, is shown by Figure 1. No. 7 Shaft was sunk from the surface to the 7th level, a total distance of 1,011.3 ft. in 1913 to replace the loss of production resulting from the gradual exhaustion of coal in the 6th level of No. 8 Shaft. In 1932 it was extended to the 8th level, at a total depth of 1,239.7 ft. Ultimately it will be sunk to the 9th and the 10th levels, at depths of 1,451.2 and 1,675.9 ft. below the surface.

Shaft Construction and Operating Details

As coal and rock are hoisted to the water level, 110 ft. below the surface, the hoisting distances from present and future levels are:

Level	7th	8th	9th	10th
Hoisting, distance, ft..	902	1,116	1,341	1,566

No. 7 Shaft has two compartments 7 ft. 6 in. by 13 ft. for coal and rock hoisting, one of the same dimensions for hoisting coal and supplies, and one 4 ft. by 13 ft. compartment for a counterweight, compressed air pipe lines and electrical conductors.

The shaft is timbered with 10 in. by 10 in. long-leaf yellow pine. Shaft sets consist of two wall plates, two end plates, three buntons and ten studdles or punch blocks. Sets are spaced on 5-ft. centers, excepting where conditions of the strata require closer spacing. Bearer sets are placed at every fifth or sixth regular set. The sets are planked tight with 2-in. yellow pine between the outside of the timbers and the rock.

The guides are 5 in. by 11½ in. long-leaf yellow pine, 30 ft. long, with planed surfaces, fastened to the timbers with 1½-in. by 10-in. wooden pegs.

Hoisting cages are the single deck platform type, with automatic car stops to center the car and hold it fixed on the cage during hoisting or lowering.

Handling Cars at Levels

Caging of the cars at the mine levels is performed by a mechanical and gravity system. At each level two drums of a four-drum hoist move three or four cars at a time up a short incline. After passing over a knuckle they run four or five car lengths down grade, where they are stopped by semi-automatic hooks engaging the axles. By means of a hand lever the hooks are operated to release one car at a time, which then moves by gravity a distance of 10 or 12 ft. onto a transfer. Operated by the other two drums of the caging hoist, the transfer moves at right angles to the tracks and places the car in position to enter the desired shaft compartment. Car stops engage the axle of the car, and hold it in place during movement on the transfer.

When released from the transfer by a hand lever, the car moves on a heavy down grade a distance of about 10 ft. to the cage. The entering car bumps the other off the cage which has just been landed at either top or bottom of the shaft, and the car leaving the cage runs by gravity to a turnout, where trips are made up.

Weights of the cages, cars and coal and rock loads hoisted in No. 7 Shaft are:

Cage	11,000 lbs.
Empty car	5,500 lbs.
Coal load	9,000 lbs.
Rock load	11,000 lbs.

Hoisting rope is 1⅝ in. in diameter, weighing 4.2 lbs. per ft.

Cylindro-Conical Drums Selected

In the old Vulcan steam hoist at No. 7 Shaft, 10-ft. diameter cylindrical drums were driven by a 30 by 60-in. hoisting engine at a maximum rope speed of 3,000 ft. per minute. In the new hoist, in order to reduce the power demands during the accelerating periods of the hoisting cycles, and thereby minimize the rating of driving motor required, 9-ft. to 15-ft. cylindro-conical drums were selected. One of the two drums is keyed to the shaft and the other is driven through a multiple-tooth

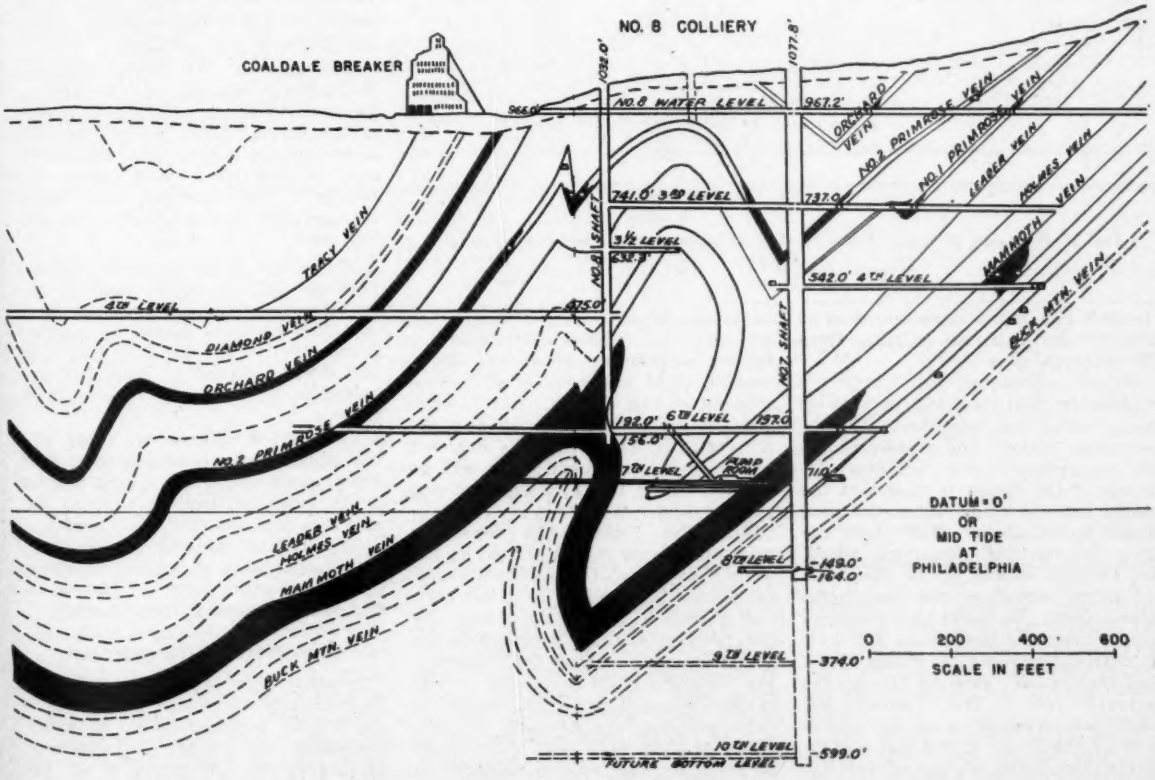


Fig. 1. Cross-section of coal measures through No. 7 shaft at which the hoist is installed. Note future bottom at 10th level

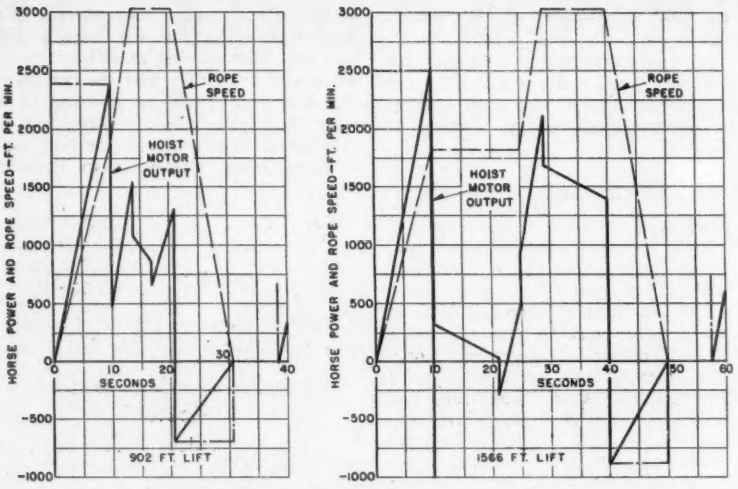


Fig. 2. Calculated duty cycles, hoisting coal from 7th and 10th levels

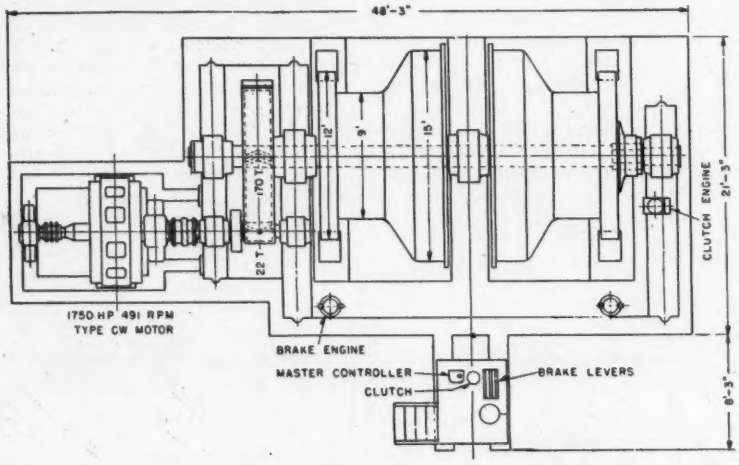


Fig. 3. Plan view of hoist. The 9 to 15-ft. cylindro-conical drums are of nickel cast iron

clutch, which permits the drums to be adjusted for balanced hoisting from the different mine levels.

Where cylindro-conical drums are applied in fast hoisting service to lower power demands during the accelerating periods, the greatest benefits are generally obtained when the roping of the drums is such that the loaded rope is wound up to the base of the conical section at the time the drum reaches full rotational speed, and then is wound up to the large cylindrical section in the least practicable time. To fulfill this condition and at the same time adapt the 9 ft. to 15 ft. cylindro-conical drums to the requirement of hoisting from the various levels in No. 7 shaft, the drums are designed to utilize only a part of the 9 ft. cylindrical section during the initial period of service, when hoisting from the 7th and 8th levels only. For this duty each rope is taken through a hole in the 9th groove of the small cylindrical section to the attachment inside the drum, leaving eight idle grooves at the beginning of this section. Later, when the 7th level is abandoned and the hoist will operate from the 8th, 9th and 10th levels, longer ropes will be applied, using the full width of the small cylindrical section.

Table No. 1 shows the manner in which the ropes will be wound on the several sections of the cylindro-conical drums, for hoisting from the various mine levels, with the initial and the final roping. The active turns shown in this table are for the hoisting distances from the various levels to the Water Level. As the 15-ft. drum sections are grooved for 19.5 turns, or 2.42 more than the number of turns on this section required to hoist to the Water Level, by winding 2.31 additional turns, or nearly the full width of the 15 ft. section, the cage is hoisted the additional 110 ft. from the water level to the surface.

With reduction gearing of 170 to 22 ratio between the driving motor and drum shafts, at 490 r.p.m., of the motor, the approximate average value during the full speed portions of the hoisting cycles, the corresponding speed of 63.5 r.p.m. of the 9 ft. to 15 ft. cylindro-conical drums will permit duty cycles to be maintained from the various hoisting levels as given by Table No. 2.

Figure No. 2 shows the calculated power demands for hoisting coal from the 7th and the 10th levels.

Hoist Assembly

Figure No. 3 shows a plan view of the hoist. The 9 to 15 ft. cylindro-conical drums are of nickel cast-iron, grooved for 1⅝-in. ropes. The left drum is keyed to the forged steel hoist shaft and the right drum is driven through a multiple-tooth clutch, carried on a hexagonal section of the shaft. Each drum carries the 12 ft. diameter cast steel ring of a parallel-motion, gravity-set brake. The brakes are controlled through two floating-lever air brake engines. The clutch on the right drum also is operated through an air engine, and the clutch and the brake on this drum are interlocked so that the brake must be set before the clutch may be released, or the clutch engaged before the brake may be released.

The gear of the single reduction herringbone gearing is mounted on the drum shaft and the pinion is connected through Fast flexible coupling to the driving motor. Gear and pinion are enclosed in a rear guard. An auxiliary band brake, also under manual control, is applied to the pinion shaft.

The drum shaft in four pedestal bearings and the pinion shaft in two pedestal bearings are carried on a cast iron bedplate bolted to concrete foundations. The steel bedplate of the driving motor is extended and bolted to the end of the hoist bedplate.

The hoist is equipped with two Vulcan safety devices, one geared to each drum, and a single dial, double pointer depth indicator, located between the two drums in front of the operator.

All rotating parts of the hoist, including the rotor of the driving motor have an effective WR^2 of 6,600,000 lb. ft.,[2] referred to the drum shaft.

Electrical Equipment

In many mine hoist installations of this capacity and speed the use of a d-c motor supplied from a motor generator set would be considered necessary, for equalization of demands on the power supply system, or to obtain the benefits of automatic

deceleration and other refinements of d-c adjustable voltage control. Selection of an a-c wound rotor induction motor for the No. 7 shaft hoist, however, was based upon practical considerations of local conditions:

As the power taken by all collieries of Lehigh Navigation Coal Company is metered at one point, the demands of the hoist motor are negligible in comparison with the total demand.

Although the energy consumption of a d-c hoist motor with adjustable voltage control may be expected to be less than that of an a-c hoist motor in this service, the savings in energy costs were considered insufficient to warrant the higher first-cost of a d-c hoist installation.

As the operators are men of long experience and skilled in the control of high-speed mine hoists, the automatic features possible with d-c adjustable voltage control were considered unnecessary.

Motor

An a-c wound rotor induction motor of 1,750 hp. continuous rating was determined to be capable of continuous operation with safe temperature rise on any of the required duty cycles, hoisting coal or rock with cages and empty cars in balance. Although it is very unlikely that it will ever be necessary to hoist rock continuously for any extended period of time, the motor is capable of such duty with safe temperature rise above an ambient temperature as high as 40 degrees Centigrade.

The motor is capable also of hoisting the rock load of 11,000 lbs. in an unbalanced cage from any mine level to the surface.

TABLE NO. 1—ROPING OF 9-15 FT. CYLINDRO-CONICAL DRUMS

Initial Roping

Hoisting from	7th Level		8th Level	
	Turns	Feet	Turns	Feet
Acceleration on 9 ft. diameter	5.28	151.5	5.28	151.5
Full speed on 9 ft. diameter	...	....	7.46	214.0
Full speed on conical section	4.00	152.0	4.00	152.5
Full speed on 15 ft. diameter	7.29	349.5	7.29	349.5
Deceleration on 15 ft. diameter	5.28	248.8	5.28	248.8
Totals	21.85	902.3	29.31	1,116.3
Active turns on 9 ft. diameter	5.28		12.74	
Inactive turns on 9 ft. diameter	7.46		....	
Holding turns on 9 ft. diameter	3.26		3.26	
Idle turns on 9 ft. diameter	8.00		8.00	
Total	24.00		24.00	

Final Roping

Hoisting from	8th Level		9th Level		10th Level	
	Turns	Feet	Turns	Feet	Turns	Feet
Acceleration on 9 ft. diam.	5.28	151.5	5.28	151.5	5.28	151.5
Full speed on 9 ft. diam.	...	....	7.87	225.0	15.70	450.0
Full speed on conical section	4.00	152.5	4.00	152.5	4.00	152.5
Full speed on 15 ft. diam.	11.8	563.5	11.8	563.5	11.8	563.5
Deceleration on 15 ft. diam.	5.28	248.8	5.28	248.8	5.28	248.8
Totals	26.36	1,116.3	34.23	1,341.3	42.06	1,566.3
Active turns on 9 ft. diam.	5.28		13.15		20.98	
Inactive turns on 9 ft. diam.	15.7		7.83		....	
Holding turns on 9 ft. diam.	3.02		3.02		3.02	
Idle turns on 9 ft. diam.	....		....		....	
Total	24.00		24.00		24.00	

The turns tabulated above are for the hoisting distances from the various mine levels to the Water Level. As the 15 ft. cylindrical sections of the drums are grooved for 19.5 turns, or 2.42 turns more than the maximum on this section for hoisting to the Water Level, by winding 2.31 additional turns, or nearly the full width of the 15 ft. section, the cage is hoisted the additional 109.6 ft. from the Water Level to the surface.

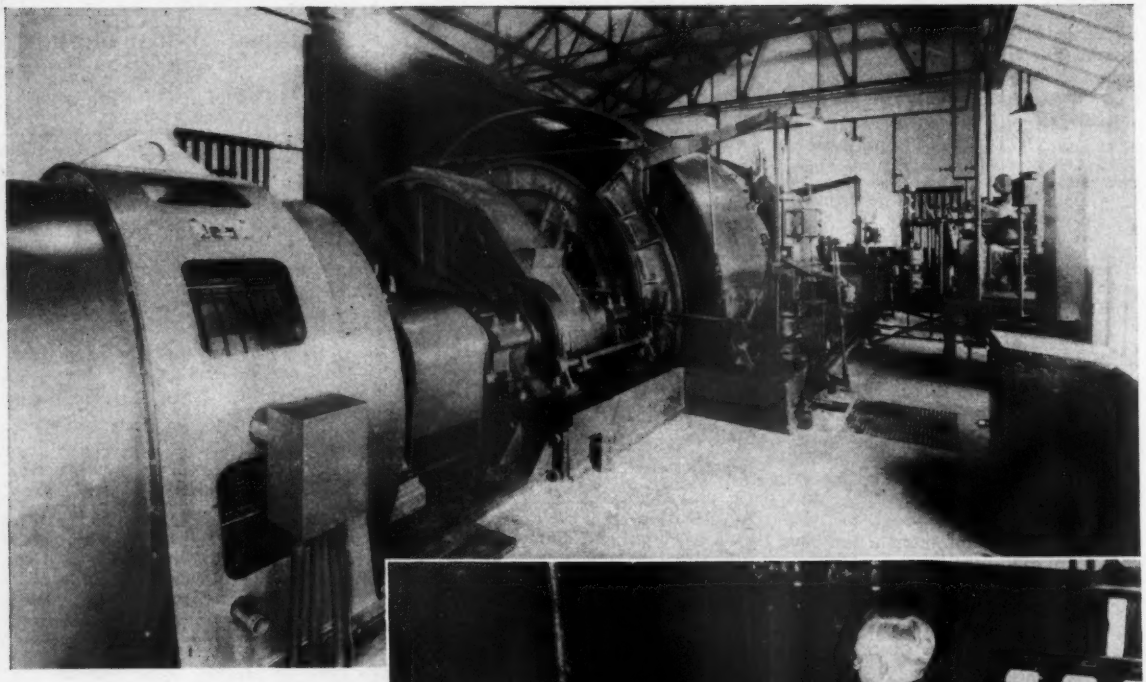
TABLE NO. 2—HOIST DUTY CYCLES

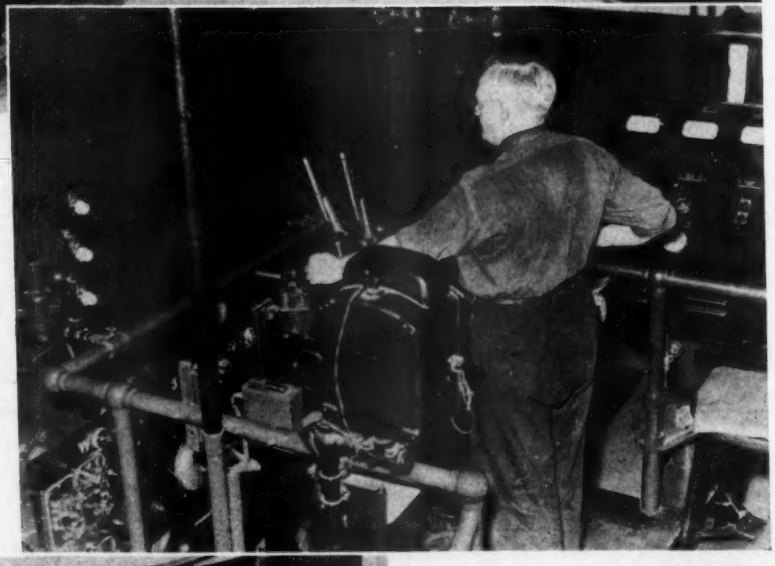
Level	Initial Roping 7th		Initial Roping 8th		Final Roping 8th		Final Roping 9th		Final Roping 10th	
	Sec.	Turns	Sec.	Turns	Sec.	Turns	Sec.	Turns	Sec.	Turns
Acceleration	10	5.28	10	5.28	10	5.28	10	5.28	10	5.28
Full Speed	10.7	11.29	17.8	18.75	15	15.8	22.4	23.67	29.8	31.50
Deceleration	10	5.28	10	5.28	10	5.28	10	5.28	10	5.28
Caging	8	0	8	0	8	0	8	0	8	0
Total	38.7	21.85	45.8	29.31	43	26.36	50.4	34.23	57.8	42.06
Trips per hour		93		78.5		83.5		71.5		62
RMS Loadings of Hoist Motor:										
Hoisting coal		1,780 H.P.		1,685 H.P.		1,710 H.P.		1,640 H.P.		1,590 H.P.
Hoisting rock		1,890 H.P.		1,790 H.P.		1,830 H.P.		1,755 H.P.		1,710 H.P.

The 1,750 hp. continuous rating of the wound rotor induction motor driving the hoist is at a temperature rise not exceeding 40 degrees Centigrade at 2,200 volts, 3-phase, 25 cycles. The motor is wound for six poles, and the speed at rated load is 492 r.p.m. The locked rotor voltage is 1,178 volts, and the full load rotor current is 674 amps. Test performance of the motor shows efficiency approaching 95 percent and power factor above 90 percent, over wide range of load.

The motor is insulated and braced to withstand safely the application of heavy counter-torques and rotor voltage of twice the locked value, which are developed when the primary connections are reversed when the motor is running at full speed. The use of counter-torque braking, or plugging, is not practiced in regular control of the hoist, however, and the relatively small braking torques necessary for deceleration in normal balanced hoisting service are well within the capacity of the mechanical brakes.

The stator frame and the rotor spider, of heavy welded steel construction, carry the laminated cores. The slots in the rotor core are of the partially-closed form, with an open-

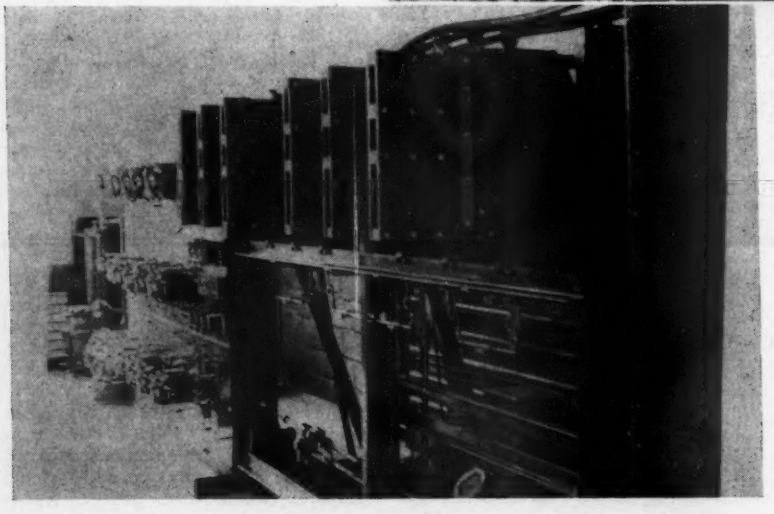




Above: General view of hoist installation—refer to Fig. 3

Right: Hoist control stand arranged for maximum convenience

Below: Electro pneumatic contactors. This is the company's third installation of this type control



ing in the top wide enough to admit, one at a time, the two coils which are placed side-by-side in the top and bottom of each slot. This construction and the open slots of the stator core permits all coils to be completely formed to final shape, insulated and varnish-impregnated before being placed in the slots. At the same time, the partially-closed rotor slots improve motor performance.

Liberal use is made of mica in the insulation of the stator and the rotor coils. A mica wrapper of several turns is used on the slot portions, varnished cambric tape on the end turns, with an outer layer of cotton tape serving as a mechanical binder before varnish treatment. End turns of the stator winding are securely lashed to insulated steel rings.

The motor is self-ventilated by a

steel fan at each end of the rotor, running inside the stator and shields. Ventilating air is taken in axially at the two ends, distributed over the extensions of the windings, through radial ducts in the cores, and is discharged through openings in the periphery of the stator frame.

Two ring-oiled pedestal bearings carrying the rotor are mounted on the motor bedplate. The bedplate and shaft are of such length that the stator may be moved a distance sufficient to clear all windings for inspection or repairs.

Each bearing is equipped with a temperature relay to give warning of excessive temperature. Resistance coils embedded in the stator slots may be connected to an instrument to indicate the motor temperatures. Space heaters located in the stator frame take 3 kw. from 440 volt circuit when the control is in the "off" position, to keep the motor windings slightly warm and minimize condensation of moisture when the hoist is idle.

Control

Control of the 1,750 hp. induction motor is of the full magnetic type, with electro-pneumatic primary reversing contactors and d-c operated secondary contactors.

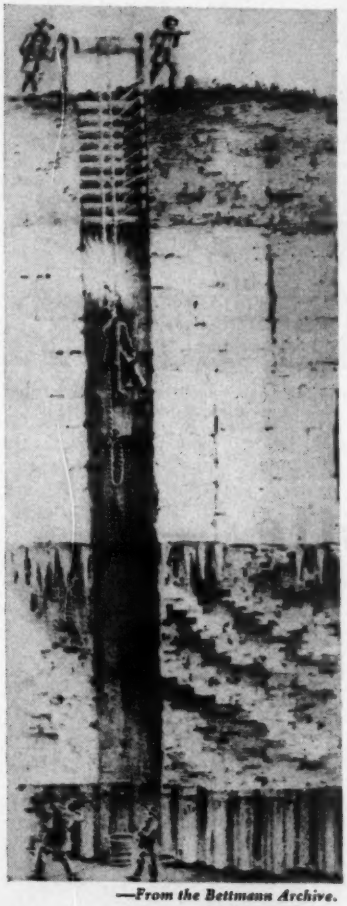
The incoming 2,300 volt, 3-phase, 25 cycle power circuit is brought to a 600 amp., 7,500 volt, 3 pole, oil circuit breaker, having an interrupting rating of 50,000 kva. The circuit breaker is mounted in a steel enclosure with the operating handle on a front panel. In the enclosure are also mounted two 1,200/5 amp. current transformers and two 20/1 ratio potential transformers for protective devices and instruments.

Two overcurrent relays mounted on the panel are connected to trip coils on the circuit breaker cover plate, which is also equipped with a capacitor time delay undervoltage trip. The panel also carries a polyphase watthour meter.

The primary reversing group of six 500 amp. air-break electro-pneumatic contactors, carried on a steel frame as shown on page 26, are similar to those which have proven very successful in control of 1,200 hp. hoist motors at two other shafts of Lehigh Navigation Coal Company, who pioneered in the use of electro-pneumatic control of large a-c mine hoist motors. The first 1,200 hp. installation was made in 1924 and the second in 1928. The present installation is therefore their third large mine hoist using electro-pneumatic control.

Each electro-pneumatic contactor is closed against pressure of a strong spring by compressed air taken from the same system that supplies the hoist brake and clutch engines. Admission or exhaust of air to or from the operating cylinder of each contactor is controlled by a small d-c magnet valve, operated from the reversing contacts of the master switch. When the magnet valve is de-energized the contactor is opened positively and rapidly by powerful spring pressure.

Two of the six electro-pneumatic contactors are closed for each direction of rotation, and the other four contactors are operated in pairs to reverse connections to two of the primary terminals of the motor for opposite directions of rotation. Thus in each direction of rotation four contacts are closed and two of these are in series, providing a double break in one primary lead. The contactors are electrically interlocked and a potential interlocking relay, connected through a small transformer to the motor primary terminals, prevents closing the contactors when any potential is present on the motor primary windings.



—From the Bettmann Archive.

American coal mine with primitive hoist operated by two men (Lithograph around 1850.)

Secondary circuits of the motor are controlled by two 500 amp. and seven 800 amp., two pole magnetic contactors, connected to taps on a bank of 36 frames of 14-in. grid resistors. Resistors are designed to limit the secondary current on the first point of control to approximately 30 percent of full load motor current, and are capable of heavy intermittent speed regulating duty in shaft hoist service. The 500 amp. contactors are connected to high resistance taps of the resistor, which limit the currents to within the capacity of the contactors.

The first two secondary contactors, which provide starting torques less than that required for acceleration of the hoist under normal conditions, are controlled directly from contacts of the master switch, and are used mainly for speed control under light loads, as in shaft or rope inspection. The last seven contactors are controlled from contacts of the master switch, with inductive time limit relays which limit the accelerating time of the hoist to a predetermined minimum value.

All primary and secondary contactors and accelerating relays are energized from a 250 volt d-c control circuit, supplied by a small motor generator set. The 7½ hp., 440 volt, 3-phase, squirrel cage motor driving this set is connected to a small three-phase transformer bank, which also supplies the hoist air compressor motor.

A vertical-handle reversing master switch on the hoist platform provides eight points of speed control in each direction of operation.

Hoist protective features include:

Overspeed and overtravel protection by the Vulcan safety device geared to each drum.

Brake wear limit switches.

Emergency stop switch on the hoist platform.

An enclosed back-out switch on the hoist platform permits application of power after opening of any of the overtravel limit switches only in a direction to back out of the overwind.

Operation of any of the safety devices opens two low voltage and brake relays, removes power from the motor and de-energizes the brake solenoids. The drum brakes are then applied by gravity. Upon reclosing of the safety device, the master switch must first be returned to the "off" position, to reset the low voltage relays, before operation of the hoist can be resumed.

A small panel on the operator's platform carries an a-c ammeter, a-c voltmeter and a d-c voltmeter showing voltage on the control circuit.

Mechanical parts of the hoist were manufactured by Vulcan Iron Works, Wilkes-Barre, Pa., and electrical equipment by Westinghouse Electric & Manufacturing Company.

Early mining at Mine LaMotte was by hand tools and wheelbarrow. Reenactment of this scene was staged near the old "offset" mine at Mine LaMotte

Mine LaMotte —

By M. E. RICHARDS
Mining Engineer
Steelville, Mo.

The Oldest Lead Mine in the United States is Still Giving Critically Needed Ore to the War Effort

THE Mine LaMotte is said to be the oldest lead mine in the United States, and it is still operating. The St. Joseph Lead Co. and National Lead are the operators. Mine La Motte is located about 80 miles south of St. Louis, and 30 miles west of the Mississippi River, it consists of a tract of nearly 40 square miles, two-thirds in Madison County and one-third in St. Francois County. The developed lead mines occur in a tract of about four square miles, all in Madison County.

Discovery—By the French

The French discovered these lead deposits about 1720, but they were known to have been worked before this time by the Chicasaw Indians. From 1738 to 1744 the deposits were considered public property. In 1733, Francois Valle received a grant of 2,000 arpents (1,666 acres) from the Spanish government, and 18 years later he received about 28,000 arpents (23,333 acres) more, as a recompense for the killing of his son by the Indians. After the death of Valle the land passed to his sons, Francois Valle and Jean Baptiste Valle and Joseph Pratt.

A modern 2,000-ton mill today handles ore from this famous old mine

The title to the land, which includes all the present La Motte estate, was confirmed by Congress in 1827. In 1828 the owners of the land sold to C. C. Valle, L. F. Linn, and Everett E. Pratt, and they in turn sold a portion in 1830 to Thomas Fleming and Son. The Valles and Flemings sold the estate in 1868 to Scott and Lock-

wood who shortly afterwards took in Rowland G. Hazard. About two years later Mr. Hazard bought the property at a sheriff's sale, and in 1875 turned it over to his son, Rowland Hazard. The estate comprised about 23,954 acres.

Almost from the first year of discovery, the mine has been a producer of lead. Up to 1878 the mining was carried on in a crude manner, the developments consisting mainly of small open pits and shallow shafts, sunk for lead in surface clay, or the shallow beds of limestone. However in 1878, more systematic work was begun, sinking shafts to bottom of the ore deposits, with more exploration and a more careful process of concentration and smelting.

Mine La Motte is located in what is known as the southeast Missouri lead belt, the largest lead producing district in the world, which extends from Bonne Terre to Fredericktown.

Geology

The geological formations within the limits of the estate consist of Archean granites and porphyries, and lower Silurian magnesian limestone (dolomite), sandstone and chert. The granite is of red variety consisting essentially of quartz grains and light red feldspar, with black mica abundant. The porphyries are a reddish brown color, essentially the same composition as the granites (quartz and feldspar), but without mica.

The lower Silurian rocks consist of white, yellow or brown basal sandstone, called the La Motte sandstone and an overlying series of Bonneterre limestone. The lead bearing group is principally in the limestone.

The Ore Deposits

The bulk of the lead ore consists of galena disseminated through limestone, although large chunks of pure galena are sometimes found in open crevices. Galena is also disseminated through sandstone in places, into which limestone frequently grades, though it is less abundant in these sandy portions. The disseminated ore is recognized as occurring principally in two horizons, but in these the ore varies in quantity, being most abundant in rocks of open porous texture, and also in portions traversed by faults and crevices; the galena being deposited by water solutions, there is a much better chance for lead deposition in open ground than in tight close structures.

The limestone of the upper horizon is known by the miners as the "Black" rock, and that of the lower horizon as the "White" rock. The ore is more persistent in the "White" rock. They have an aggregate thickness of from 70 to 144 ft., sometimes separated by as much as 6 ft. of gray limestone and at times the upper and lower groups come almost together. They dip slightly to the east, from the Archean group, cropping out to the west. It was along these outcrops that the early shallow diggings were distributed.

In the "Black" rock, near its base, is the upper ore bed. The thickness is normally found to be about 7 ft., but sometimes as much as 11 ft., and above this, for 6 or 7 ft. more, in thin seams, galena lies along joint planes and also in crevices, in bunches. The White rock or lower bed occupies a position 15 to 30 ft. above the basal La Motte sandstone, but developments often show the lead ore near the top of the "White" rock, so that the two beds may sometimes be in contact. The lower lead bearing ground, 54 ft. thick, is of a gray color. These magnesian limestones belong to the St. Francois formation, and the total thickness represented here is probably about 600 ft.

The great bulk of the lead ore consists of galena disseminated through limestone, sometimes so abundant as to constitute a major portion of the rock, but usually in scattered grains, the ore being more abundant in rock of open, porous structure, and also in sections that are traversed by faults and crevices enlarged by solution.

The distribution of the Archean rock, in this area, is such that it may be assumed that there is a great anticline traversing N.W. to S.E. The presence of faults in the mine is plainly recognizable, with a trend N.W. to S.E., which probably has an important bearing on the ore deposition, forming channels for solutions bearing lead. The location of the large lead mines along the S.E. Missouri lead belt is along a N.W. to S.E. trend. The trend of the Mississippi River in this area is N.W. to S.E., all of which may have important significance in relation to mineral deposition in this part of the state of Missouri.

Mining—By Open Stopes

The ore and roof are strong so that an open stope method of mining is used. A pillar is left every 40 to 50 ft. as support, depending on the character of the roof. The face height of the ore will vary in thickness from 12 ft. to over 100 ft. but the average would probably be about 40 ft.

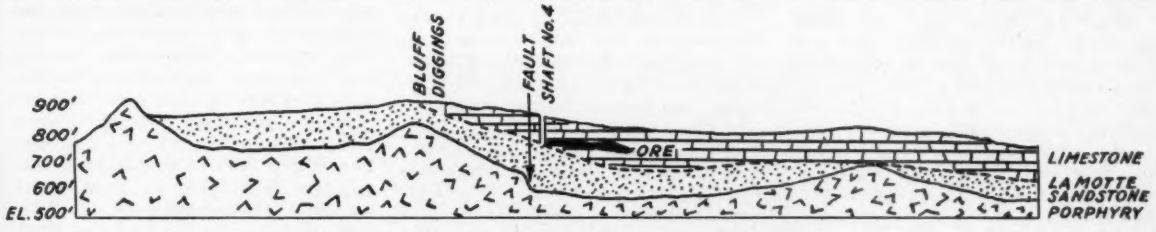
The pillars of ore are quite large, running from 15 to 30 ft. in diameter which necessarily ties up a considerable tonnage of ore; however, the ore varies in richness so that wherever possible pillars are left in lean areas. Pillars are in many cases unnecessary or too large, so that when mining is about finished, many of the pillars are removed or cut down, recovering probably about one-third of ore originally tied up in pillars.

Drilling, Blasting, Loading and Haulage

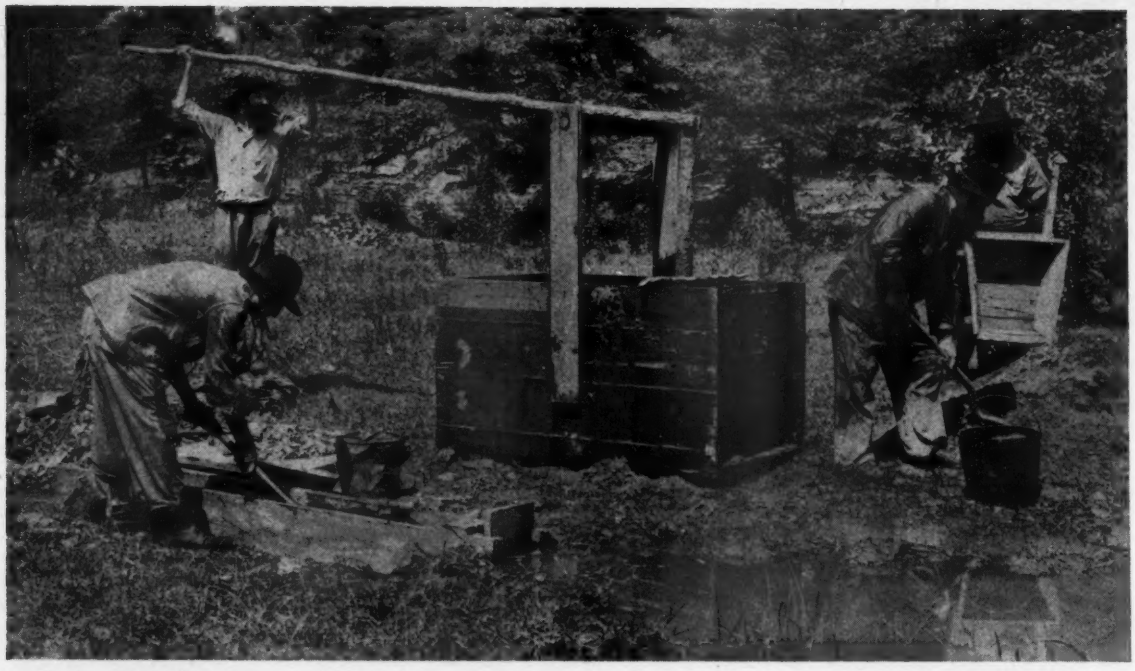
When the face of ore is high it is drilled and mined on several benches. The face may be 200 ft. wide, and it is kept irregular, to provide free faces to break to. Jack hammers, mounted on columns and with pneumatic feed, are used. The rock drills easily, so that average drilled per shift is about 90 ft. In the stopes, an average of about 110 tons of rock is broken per machine per shift. About one-half pound of 40 percent power per ton is consumed.

With the large open stopes conditions are very favorable to the use of mechanical loading machines. The St. Joseph Lead Company use the St. Joe shovel, developed by them to fit their conditions. It is very similar to the standard electric power shovel, and loads on an average of about 110 tons of ore per shift.

The older and smaller mines used mules for hauling ore in 1,200-pound cans to the shaft where they were hooked onto a cable, and lifted to surface by a hoist located directly over the shaft in the derrick—typical can-hoisting practice.



Geological cross-section showing ore relationship to stratigraphy



The hand jig, still seen occasionally in lead and zinc areas, was the chief concentrating device of the early miners at LaMotte

The large modern mines use electric motors for haulage, using 2½-ton cars which dump into a 4-ton skip, hoisted with large electric hoists.

Mine La Motte used the small equipment in the old days, but now has modern large electric equipment, steel headframe, and a 2,000-ton steel and concrete concentrating mill. In addition to the underground ore, Mine LaMotte has some shallow ore, shown in cross section as Bluff Diggings, which is mined with power shovels and trucks.

Prospecting and Development—Considerable Drilling is Needed

In lead mining, prospecting and development is an extremely important part of the mine operation, for the mineable ore is bunchy, some areas of ore are large and some small, and long and narrow, so that without close careful drilling prospecting operations are very likely to jump over an ore body missing it completely. More failures are made in lead mining on account of too little drilling, than for any other reason. It is good practice to have at least two year's ore blocked out in advance of mining, at all times.

Too many new companies go in and take over a property, with a small tonnage of high grade ore drilled out and go strong for a year or two, pay all their profits out in dividends, do not plow back in say 40 cents a ton extra cost for drilling and development, possibly do a little drilling, but not enough, then wake up all of a sudden and find they are out of ore, *and out of the lead business.*

It is also important to make a careful study of drill hole cross-sections, and mapping of underground structure, particularly the faults and fracturing, the general trend of which will show the most favorable area for ore. All drill holes in this territory should be bottomed in the La Motte sandstone. A sharp upturn in the sandstone indicates a sharp folding and fracturing of limestone formation above, thus indicating an area favorable to ore deposition.

The magnetometer is now being used in this district, with some favorable results, for it will show up sharp folding in sub-structure granite, which indicates that the limestones have been brought up sharply which causes fracturing.

The Keystone type drill is largely used in this district. It will put a 6-in. hole down for about $1 per ft., and will give accurate results.

Gravity Concentration and Flotation

Lead ore, galena, is comparatively easy to concentrate, as the specific gravity of the lead is so much higher than the limestone which carries it. The finely disseminated ore, however, takes rather fine grinding.

In the early days Mine La Motte had very small and crude concentrating mills, some of the ore going through small hand jigs, today, however, a very modern 2,000-ton mill is in use. The chunky crude ore first goes through large crushers, then over rolls, into rougher jigs, to cleaner jigs, from which the heavy chats are run over rolls again, then over tables, the tails of which go into a rod mill for very fine grinding, then to flotation cells which recover the very fine lead. The water from the mill goes into a large Dorr thickener from which the slimes are pumped back into flotation plant and the fine lead recovered. The chat piles are very clean, and the writer would estimate that the lead loss is less than one-half percent.

From time to time rumors are heard that Mine La Motte is about to close, after being worked for over two centuries; however it would not be surprising if this famous old mine worked on for another quarter of a century.

In the May Journal—

COAL MINING LOOKS AHEAD

Don't Miss It!

BOREHOLES for ESCAPEWAYS

Boreholes as Means of Escape and as Aids to Ventilation Are Receiving Wide Attention in the Coal Industry. Various Methods of Sinking Are Now Being Employed

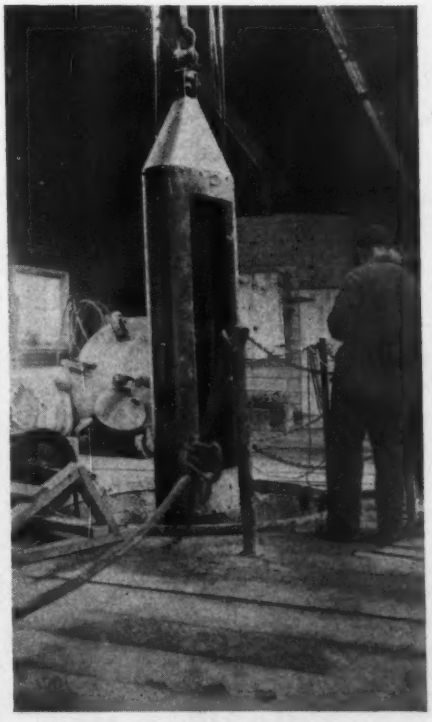
By J. V. McKENNA
Pennsylvania Department of Mines
Waynesburg, Pa.

ONE thought that has been uppermost in the minds of many mining men, particularly in the bituminous fields, has been the fear of having men trapped in a coal mine inby a mine fire with no available means of exit. Considerable study has been given this problem by the mining industry recently, due to the fact that several disasters have occurred in various states where men were lost because they were trapped inby a mine fire and could not get out and no help could get to them.

Types of Mine Fires

Before going into the actual subject of this paper, I am going to digress a little and discuss the type of mine fire whereby men are trapped and also offer suggestions as to the possibility of saving men even though there may be no available exits in the immediate vicinity. If smoke should be observed in a section where there is only one split of air with no connections to any other sections, there is only one thing that can be done and that is to short the air and build a barricade and stay behind it. This is possibly the worst condition that can exist as far as men being back of a fire is concerned.

Two things can be done to help relieve a situation of this nature: (1) Any one section should not be dependent on one split of air. Two splits should be made even if one split was small with a small amount of air traveling. If smoke were observed with two splits, the total amount of air could be shorted down one side, then the other side could be closed off and the men go out that way. (2) Connections should be made between sections so that means of escape can be had from one section to another in the event of a fire on the intake side of either section. A fire may occur on the intake side of a section where it endangers the lives of only the men on that particular section or it may occur anywhere on the main intake of the mine thereby endangering all the men inby that point.



Man-cage used in sinking borehole by Newsom process at Zenith mine, Ely, Minnesota

Ventilation During a Fire

It is rather difficult to say how the ventilation should be handled in all cases when a fire occurs on intake entries since conditions will not be the same in many instances. However, it can generally be assumed that the air should not be cut off the fire entirely, as it would then be practically impossible to fight the fire due to steam and gases coming back on the men doing that work. If at all possible, the air should be shorted immediately inby the fire or as close as possible to the fire, so that the smoke and gases will not be carried into the mine. The air going over the fire should be cut down in all cases to such an extent that only enough is passing over the fire to keep the smoke and gases moving in order that men can be kept working continually. If the air cannot be shorted inby the fire, it should be shorted outby the fire, but even sometimes this is not possible as there are no return entries on either side. In this case, it may be possible to by-pass the air partially from the fire or slow down the fan or perhaps both depending on existing conditions.

In any event when a fire occurs, several things should be done as near simultaneously as possible, that is: All men should be ordered out of the mine at once except those that are to be engaged in fighting the fire even though it is thought that the fire can be put under control, since in many cases the fires have gotten out of control and the men have been trapped. All power should be taken off the mine except that which is necessary for fire fighting purposes if it does not induce a hazard. Arrangements should be made immediately to use all available

Presented to the Coal Mining Institute of America in Pittsburgh, Pa.

equipment necessary to try and extinguish the fire. Under existing conditions today in the best of regulated coal mines fires may occur as we have many ignition hazards, therefore, it behooves us to try to use every precaution known to prevent fires and also to try to devise methods of rescue for men that may be trapped.

Big Bore Holes—a Practical Solution

The Pennsylvania Department of Mines is vitally interested in this matter of fires and the prevention of fires; however, we know from experience that some fires do get out of control and therefore other means must be studied to get men out of a mine safely when they are trapped back of a fire. Many theories have been advanced along this line recently, some that were practical and some that were not. We are interested in a means of escape that is both practical and reasonable and feel that escapeways by means of large size bore holes is practical and merits study and attention. We have always thought of an escapeway as a shaft, slope or drift to the surface. I believe that an emergency escapeway could be provided much cheaper and quicker if, instead of sinking a shaft, a bore hole large enough to permit men to get out would be put down to the coal. These bore holes could also be used for ventilation. If two or more of these holes can be drilled for the price of a shaft, and from information that can be obtained at the present time, this seems entirely possible, we would have that many more escapeways and that number of intakes for ventilation.

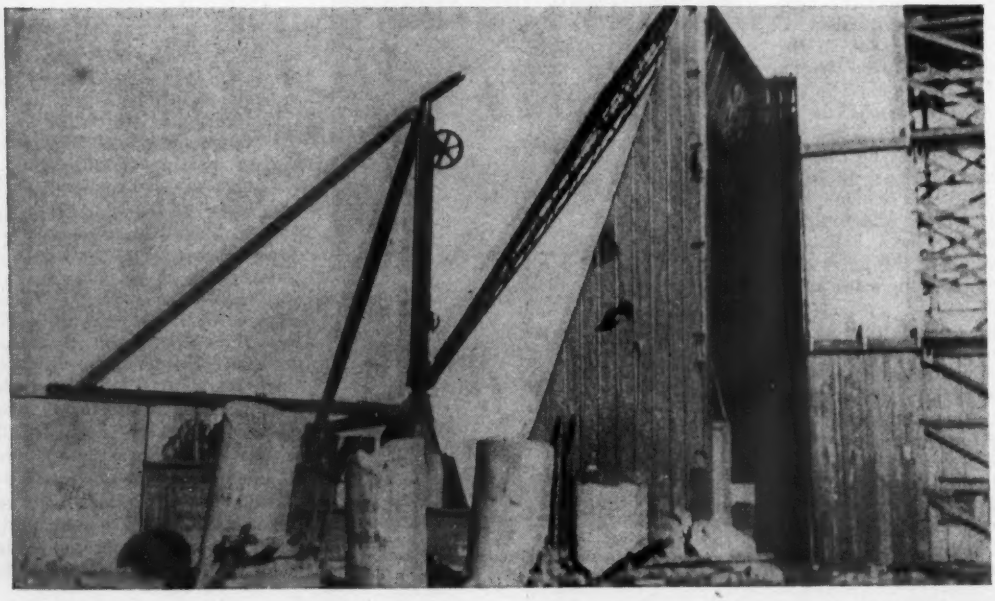
Data on Holes Already Drilled

Holes of this nature have been drilled, particularly in the West in ore mines. The deepest bore hole of this kind is described in the January 22, May 27, and August 19, 1944, issues of *Skillings Mining Review*, published in Duluth, Minn. The 5½-ft. bore hole, which was started in August, 1942, at the Cary iron mine at Hurley, Wis., was holed through to completion on May 12, 1944, to a depth of 2,500 ft. The Cary mine is operated by Pickands-Mather & Company, and practically the same equipment was used here as was used at the Zenith mine bore hole at Ely, Minn., in 1938. This hole was drilled to a depth of 1,208 ft. and was directed by J. B. Newsom, who also started the drilling operations at the Cary mine. These bore holes can be stripped down cut by cut to the size of a standard hoisting shaft, if they are not to be used for ventilation alone. Two hoists were used on the Carey hole, one for the drilling machine and one as a man hoist. The drilling is done by what is known as the chilled iron shot method. The core barrel attached immediately below the steel cabin of the drilling machine, rotates counter-clockwise about 52 revolutions per minute, grinding the cutting shoe against the 5/32-in. diameter chilled iron shot to form the core. The drilling machine in this operation is about 40 ft. long with the drill cabin, core barrel and shoe. One man within the cylindrical steel drill cabin is in the bore hole during the cutting, operating the controls. A box in the cabin releases the shot as needed to the cutting shoe at the bottom of the hole. The equipment for this type of hole is naturally very heavy due to the great depths the holes are drilled. The reason for the brief discussion of the drilling of 5½-ft. holes to depths of 2,500 ft. is only to show that it has and can be done. The cores are broken off in sections and lifted to the surface.

Escapeways Needed

As a service handling device for men going down into the hole a one-man steel shell is raised and lowered without guides. When the device is in motion the steel door is closed tight and the occupant is safe. I would like to emphasize this method of lowering or hoisting men out of mines through bore holes as many lives could have been saved where men were trapped back of mine fires or explosions if something of this nature could have been used. On the other hand, if the diameter of the hole is large enough, an enclosed steel ladder could be placed in the hole to be used as an escape in an emergency. One objection to a ladder is that a man may become stuck there from fatigue, or from other physical causes; however, I think a ladder or any other means of escape would look pretty good to a man trapped with no other way of escape.

For all practical purposes bore holes of this nature drilled in the Pittsburgh area or other like areas, would be shallow as compared to holes drilled in the Western ore fields. The holes could be spotted at points with the minimum amount of cover. Some holes of this nature have been drilled in Western Pennsylvania; however, the largest diameter hole drilled here to my knowledge, has been 36 in. The Pennsylvania Drilling



Borehole tripod of 12" x 12" timber on concrete base, Carey Mine, Hurley, Wis. Enclosure houses boring machine and all equipment except hoists. Note 5½-ft. diameter cores as pulled from the hole

Company, of Pittsburgh, has drilled a number of such holes. The drilling principle of these holes is the same as that used in the deep holes in the West, except that the entire operation is conducted from a surface plant and no one is required to be in the hole while drilling is being done. The largest hole drilled by this company is 36 in. but they are equipped to drill 48-in. holes up to a depth of around 200 ft. With more study and experience it may be possible to drill larger holes to a greater depth with the surface plant method.

Cost Considerations

The cost of drilling such holes would depend to a considerable extent on the location, due to the moving and setting up of the equipment, obtaining a water supply, disposition of the material excavated, formations to be penetrated, etc.

Some rough preliminary estimates of the cost of such holes are as follows:

30-in. diameter holes—$30 to $35 per lin. ft.

36-in. diameter holes—$35 to $40 per lin. ft.

48-in. diameter holes—$40 to $50 per lin. ft.

60-in. diameter holes—$65 to $85 per lin. ft.

These estimated costs might be reduced under ideal drilling conditions and do not include the cost of lining the holes. However, a number of plans are now being developed to eliminate any need for concrete or steel lining of the drilled hole.

Further Data Needed

The Pennsylvania Department of Mines would like to see and is highly in favor of further study and experimentation of this project so that it can be developed on a sound and practical basis to such an extent that more emergency escapeways will be installed and maintained for immediate use.

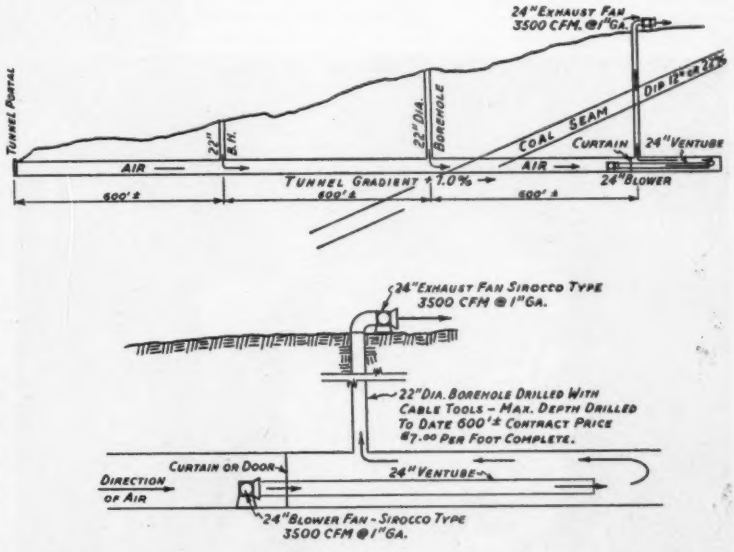
These holes can also be utilized for ventilation. The amount of air that can be taken down any one hole would, of course, depend on the size of the hole. If a sufficient number of holes were drilled and used for ventilation, it is possible that large shafts at the back end of coal properties could be eliminated, unless men and material must be handled there regularly. The ventilation from bore holes could be tied in easily with the regular ventilation system of the mine and due to the increased number of intakes, large velocities on some main haulages could be reduced. The development of bore holes for ventilation and escapeway purposes is worthy of and merits serious consideration from the standpoint of safety and economy in the future progress of the mining industry.

BORE HOLES Aid Tunnel Ventilation

ALL coal seams being mined by the Union Pacific Coal Company are pitching seams, varying from 4 to 15 degrees on the dip line, and we, therefore, ordinarily make outcrop openings and follow the true pitch of the seam with our slope lines. However, where the railroad and tipple location does not permit access to the outcrop, we have driven both level haulage tunnels and rock slopes for conveyor galleries directly against the pitch line, which necessitated some method of ventilating same during the construction period and before intersecting the coal seam and establishing ventilation at this point. The attached very rough sketch will possibly illustrate the method better than it could be described.

The 22-in. diameter boreholes are located on approximately 600-ft. centers and drilled into the tunnel roof on either rib line. The holes that we have had drilled under contract at a present cost of approximately $7 per ft. were executed by use of what is generally known as a star rig and cable tool string. The holes in excess of 150 ft. in depth are ordinarily drilled with a pilot hole of approximately 6 in. diameter and reamed out to the 22-in. diameter.

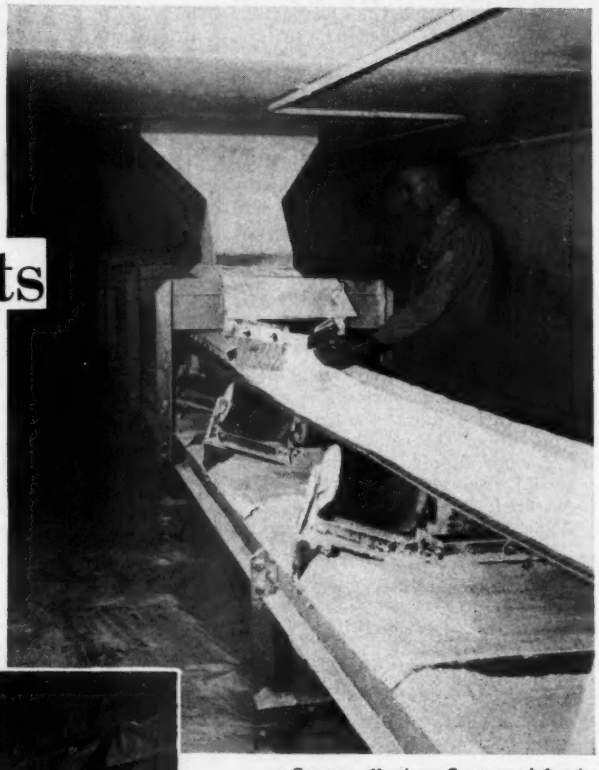
A curtain or door is installed just outby the last borehole or the one used for exhaust of return air. A 24-in. blower fan of the Sirocco type is located outby the door or curtain and the air carried to the heading by means of 24-in. flexible tubing suspended from the tunnel timber. A 24-in. exhaust fan of the Sirocco type, of capacity 3,500 c.f.m. at 1-in. gauge pressure, is located on the surface with a sheet metal approach attached from the fan to the borehole collar at the surface. We have found the method to be very efficient in that it supplies air well within the limits of the state mining law and is especially effective in clearing smoke from the heading after shooting, this being accomplished within a period of from 10 to 15 minutes. The fans are kept running at all times that crews are working in the heading. In this connection, we are advising that we do not encounter any gaseous coal seams in the Rock Springs field. You will note from the attached sketch that the 24-in. blower fan and 24-in. exhaust fan are advanced from borehole to borehole as the work progresses and that the boreholes outby merely serve as intakes when abandoned for exhausting purposes.



Excerpts from a letter to the Editor from H. C. Livingston, Asst. Gen. Manager, Union Pacific Coal Co.

Alumina For Northwest Aluminum Plants

By F. W. LIBBEY
Director
Oregon Department of Geology
and Mineral Industries



Courtesy, Aluminum Company of America

At D.P.C.'s Troutdale aluminum reduction works, operated by the Aluminum Company of America. Alumina on its way to storage bin

Courtesy, Aluminum Company of America

Method of unloading alumina from boxcars as received at Troutdale

300,000 Tons of Aluminum Reduction Capacity Exists in Plants in Oregon and Washington. Northwest Clays are Looked to as Alumina Sources for These Plants

FIVE aluminum reduction plants with a total annual capacity in excess of 300,000 tons have been built in Washington and Oregon. Three of them are located in the Lower Columbia River area at Longview, Wash.; Vancouver, Wash.; and Troutdale, Oreg., respectively. One of the others is at Spokane, Wash., and one at Tacoma, Wash. Two of the Lower Columbia River plants are privately owned; all the others were financed by the Government. Following is a table showing ownership, location and capacity of these plants:

Location and Ownership	Rated Annual Capacity Metal Tons
Longview, Wash., Reynolds Metals Co.	33,000
Vancouver, Wash., Aluminum Co. of America	91,000
Troutdale, Oreg., D.P.C., operated by Alcoa	65,000
Tacoma, Wash., D.P.C., operated by Olin Corp.	21,000
Spokane, Wash., D.P.C., operated by Alcoa	97,500
Total	307,500

These plants represent a total plant investment of nearly $75,000,000 and when operating at capacity have approximately 3,700 employes. This rated capacity of the Northwest aluminum plants is about the same as the total domestic production of primary metal in 1941 when annual output, speeded up for war purposes, was over double the rate in 1938. The alumina requirement for these plants for capacity operation is approximately 600,000 tons.

A primary consideration in the loca-

tion of aluminum reduction plants is cheap and dependable electric power, hence the establishment of these plants on the Bonneville-Grand Coulee power circuit. Another economic factor of great importance is availability of alumina. Cost of power and alumina will be governing factors in the competitive position of Northwest aluminum plants in the post-war period, and this paper is mainly concerned with the supply of alumina.

Present Sources of Alumina

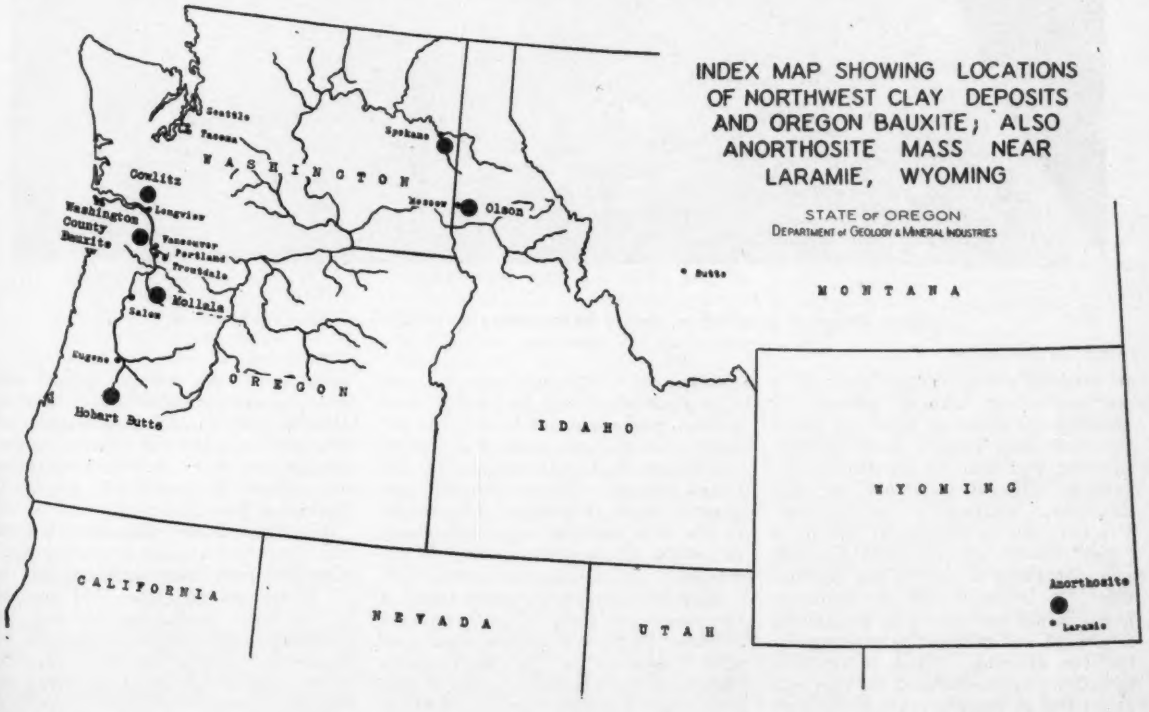
Aluminum metal is reduced from pure alumina (Al_2O_3) and, except for a minor amount obtained from alunite, the only present source of alumina to supply reduction plants is high-grade bauxite (impure hydrated aluminum oxide containing 50 to 55 percent alumina and less than 6 percent silica) which is treated in plants utilizing the Bayer process to obtain the pure alumina. These Bayer plants are all located in the Eastern and Southern parts of the country, and the alumina needed to supply the Northwest reduction plants must be transported across the country.

Domestic high-grade bauxite reserves were never large as compared to those in some other countries, notably French and British Guiana. Present United States' reserves of high-grade material are reported to be very small, and producing companies are depending principally on South American bauxite to supply the Bayer plants; thus, under present conditions this country's production of primary aluminum is for the most part dependent on foreign sources of bauxite. For future domestic sources of supply of aluminous material which can be used to produce alumina on the scale required, reliance must be placed on low-grade bauxites and high-alumina clays and other aluminum silicates.

Courtesy, R. L. Nichols, U. S. Geol. Surv.

Hobart Butte in Lane County, Oregon, holds promise as a source of alumina

Aluminum constitutes nearly 8 percent of the earth's crust and ranks third in order of abundance of all the elements. It is outranked only by oxygen and silicon, and, although aluminum is universally abundant, it is at the same time nearly always combined with silica in rocks, forming aluminum silicates. The separation of alumina from silica in these silicates is accomplished with much difficulty as compared with separation of pure alumina from impurities in the relatively rare high-grade bauxite. Just how much in dollars and cents this difficulty represents is not definitely known at present, but an answer will be indicated after three experimental plants, financed by the Government and designed to treat aluminum silicates, have been operated a sufficient length of time. These plants are located at Harleyville, N. C.; Laramie, Wyo.; and Salem, Oreg.



The first of these experimental plants was designed, built, and is to be operated by the Ancor Corporation; the second was designed, is being built, and will be operated by the Monolith Portland Midwest Company; and the third was designed, is being built, and will be operated by the Chemical Construction Company. When satisfactory plant operation is obtained, this last plant will be turned over to the Columbia Metals Corporation. The Harleyville plant will use a lime-sinter process[2]; the Laramie plant a so-called soda-lime-sinter process[2]; and the Salem plant an acid ammonium sulphate process.[3]

Alumina Processes

In general, processes for treating aluminous materials to produce alumina are classed either as alkaline or acid. Silica consumes reagents in alkaline processes while iron is relatively inert; the reverse is true in acid processes.

The Bayer process,[4] generally used to produce alumina from bauxite, is the best known alkaline process. It employs fine grinding, digesting under pressure with caustic soda solution, filtering, and treating the filtrate containing sodium aluminate so that aluminum hydrate is precipitated. Precipitation is started by adding a "seed" charge of aluminum hydrate, and obtaining a crystalline precipitate. It is facilitated by agitation and gradual cooling. The precipitate is filtered and calcined to produce anhydrous alumina. Silica is attacked by sodium hydroxide and, for this reason, silica in bauxite must be kept as low as possible to keep down the cost of this expensive reagent.

A great many processes for separation of alumina from its natural compounds have been patented. Some of them, besides the Bayer process, have been used commercially. Both Germany and Russia are reported to have built large plants for extraction of alumina from clays and other silicates. In Norway the Pedersen process has been used to produce pig iron and a calcium aluminate slag from which alumina may be extracted with sodium carbonate solution. Raw materials used by Pedersen were bauxite, iron ore, coke, and lime. Ferruginous bauxites would be amenable to the same treatment.

The lime-sinter and soda-lime-sinter processes to be used at the D. P. C. plants at Harleyville and Laramie are alkaline processes which in outline consist of sintering the aluminous material with limestone or with limestone and soda ash. Although details of these processes have not been made public, the aluminate formed in the kiln presumably will be leached with sodium carbonate solution. The recovery of alumina from the sodium aluminate solution would follow the usual pattern. These processes require a large proportion of limestone in the raw material mix, and cheap limestone of requisite purity is essential.

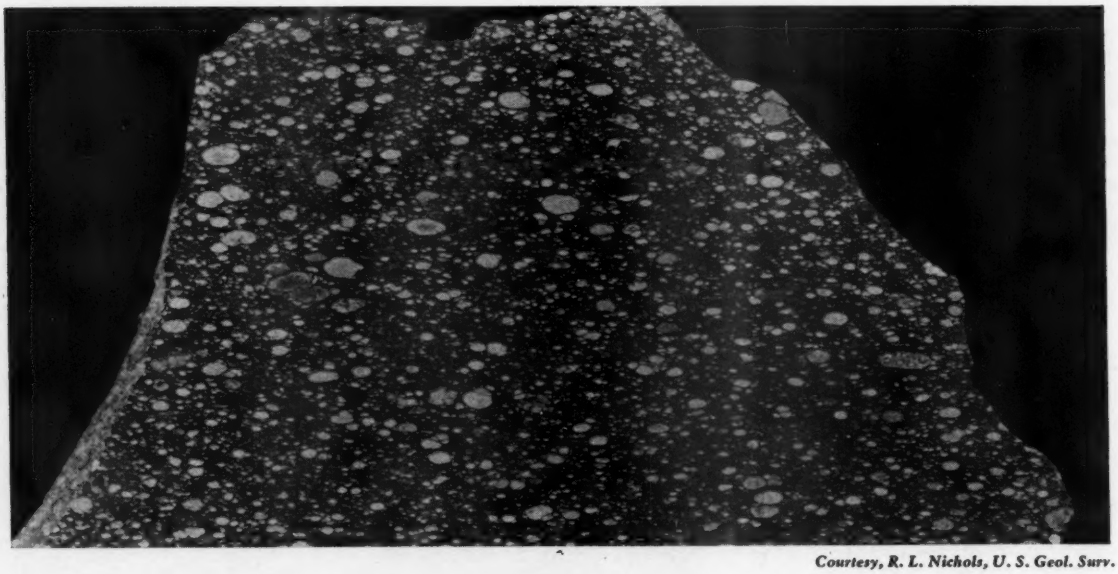
Most acid processes involve treating the aluminous material with an acid in order to form a soluble aluminum salt. Because of its comparative cheapness and availability, use of sulphuric acid has been proposed in many patents. Some other sulphates have been advocated, and, at the Salem D. P. C. plant briefly described below, ammonium sulphate is to be used to convert the aluminum silicate in clays to aluminum sulphate, with regeneration of ammonium sulphate.

Northwest High-Alumina Clay Deposits

In the Northwest there are many known deposits of clay and other aluminum silicates which carry a relatively high percentage of alumina. Many of them have been sampled in reconnaissance surveys by Federal and State mining bureaus, and a few areas have been systematically investigated.

The clay deposits in western Oregon were described by Wilson and Treasher.[5] Subsequently the U. S. Bureau of Mines in cooperation with the U. S. Geological Survey explored by means of drilling the deposits at Hobart Butte[6] in Lane County, 12 miles south of Cottage Grove (140 miles south of Portland), and at Molalla,[7] about 40 miles south of Portland. A report[8] with maps on the geology of the Molalla locality has been placed in open file by the U. S. Geological Survey.

Washington clay deposits at Cowlitz,[9] near Castle Rock, and in Spokane County[10] have been explored by the U. S. Bureau of Mines and mapped by the U. S. Geological Survey. Information concerning the Olson, Idaho, deposit as well as the other clay deposits mentioned above is given by Wimmler, et al.[11]



Courtesy, R. L. Nichols, U. S. Geol. Surv.

Polished surface of sample from Hobart Butte showing kaolinitic clay pebbly conglomerate

In the aggregate the northwest clay deposits which have been explored are reported to contain from 184,000,000 to more than 200,000,000 tons of measured and indicated clay (natural) depending on "cut off" point of alumina and ratio of thickness of overburden to clay. A much greater quantity of such clay may be inferred.

"Available" alumina[12] content of these clay bodies ranges from 24.3 percent at the Olson locality to 29.9 percent at Cowlitz. "Available" ferric oxide (important because it uses up acid in the acid process) ranges from 4.5 percent at Hobart Butte to 8 percent at Molalla.

According to Wimmler et al,[13] tonnages of measured and indicated clay at these deposits as of November 1, 1943, were 29,000,000 at Hobart Butte; 53,460,000 at Molalla; 15,000,000 at Cowlitz; and 66,324,000 at Olson. In addition, more than 20,000,000 tons has been indicated by the Bureau in the Excelsior region near Spokane, Wash. Undoubtedly some of these tonnage estimates could now be increased, and it is known that, by including material containing somewhat more iron, the estimate for Hobart Butte may be increased by many millions of tons without lowering the average "available" alumina percentage materially.

The aggregate tonnage of all the deposits explored is, of course, rather meaningless because the deposits are widely separated, and it would not be practical to treat clay from all the deposits at one plant because of transportation expense, if for no other reason. However, known and potential tonnages of clays, approximately the same in quality as given above, at the individual deposits are large, and the factor of available tonnage at individual deposits is the least in importance of all the factors bearing on economic treatment of the clays. As far as tonnage alone is concerned, any one of five localities mentioned would probably warrant an alumina plant, capable of supplying the alumina requirements of Northwest aluminum plants for many years in the post-war period. All of the deposits are susceptible of surface mining, and the tonnage estimates were based on an economic stripping ratio, so that cost of mining and delivery of clay to a treatment plant would be correspondingly low. In this cost feature, at least, clay would have an advantage over high-grade bauxite.

Salem Alumina-from-Clay Plant

Clays in Oregon and Washington will be treated experimentally at the D. P. C. plant near Salem, Oreg., now nearly completed. An acid ammonium sulphate process developed by the Chemical Construction Company, a subsidiary of the American Cyanamid Company, will be used. Although no details of the flow sheet have been made public, it is reported that clay will be sintered with ammonium sulphate in a rotary kiln. The aluminum sulphate formed will be leached out with dilute sulphuric acid, and this solution purified by recrystallization. Finally, aluminum hydroxide will be precipitated with ammonium hydroxide or ammonium carbonate. As in all other wet processes the aluminum hydroxide will be filtered, dried, and calcined to alumina. Ammonium salts will be recirculated. Reportedly the first clay to be treated will be from the Cowlitz locality. The plant covers several acres, and is served by the Oregon Electric Railway Co., a subsidiary of the Spokane, Portland, and Seattle Railroad.

Courtesy, Aluminum Company of America

Pouring molten aluminum into pig molds at the Vancouver, Wash., plant of the Aluminum Company of America

Laramie Anorthosite Deposit and Plant

This project has certain unique features that may contribute to making it the cheapest source of alumina from silicate materials. The anorthosite to be treated covers an area of 125 square miles in the core of the Laramie Mountains just northeast of Laramie. The rock is made up essentially of labradorite, and the quantity available may truly be said to be inexhaustible. According to Fowler,[14] the anorthosite contains approximately 28 percent Al_2O_3, 53 percent SiO_2, and 10.94 percent CaO, together with 4.19 percent Na_2O. It is reported that this material contains 24 percent alumina which is considered "available" or recoverable.

The D. P. C. experimental plant now nearing completion will, according to reports, use a soda-lime sinter process, in which necessary raw materials are soda, limestone, and coal, sources of all of which are located fairly close to Laramie. Whether sufficient alkali exists in the anorthosite is not known to the writer. In the process developed by chemists of the Monolith Portland Midwest Company, which has a cement plant at Laramie, cement sinter is to be produced as a by-product of the sintering of the raw materials. This by-product together with easy availability of adequate quantities of raw materials, may make this plant at Laramie the most

important of all the silicate testing plants. It has been reported that clays also will be treated experimentally at the Laramie plant.

Ferruginous Bauxite, Washington County, Oregon

From a present-day competitive standpoint, probably the most important Northwest source of high-alumina materials is located within 25-30 airline miles of the aluminum reduction plants at Vancouver and Troutdale. This area, in northern Washington County, Oreg., contains flat-lying ferruginous bauxite deposits of considerable areal extent and of remarkable consistency in thickness. These deposits so far have been found rather widely scattered in four adjoining townships, but there is reason to believe that further search will enlarge the ore-bearing area.

In excess of five million long tons has been indicated by auger-hole drilling by the Oregon Department of Geology and Mineral Industries, and further exploration will undoubtedly increase reserves considerably. The ore is reddish brown in color, in part soft and clay-like, and in part hard and irony. Generally the ore is oölitic and magnetic but some of the ore is earthy and pebbly, and is nonmagnetic or slightly magnetic. Information available at present shows an average content of about 33 percent alumina, 24 percent iron, and 8 percent silica, but samples from the southern part of the area have shown as much as 46 percent alumina, with correspondingly lower iron.

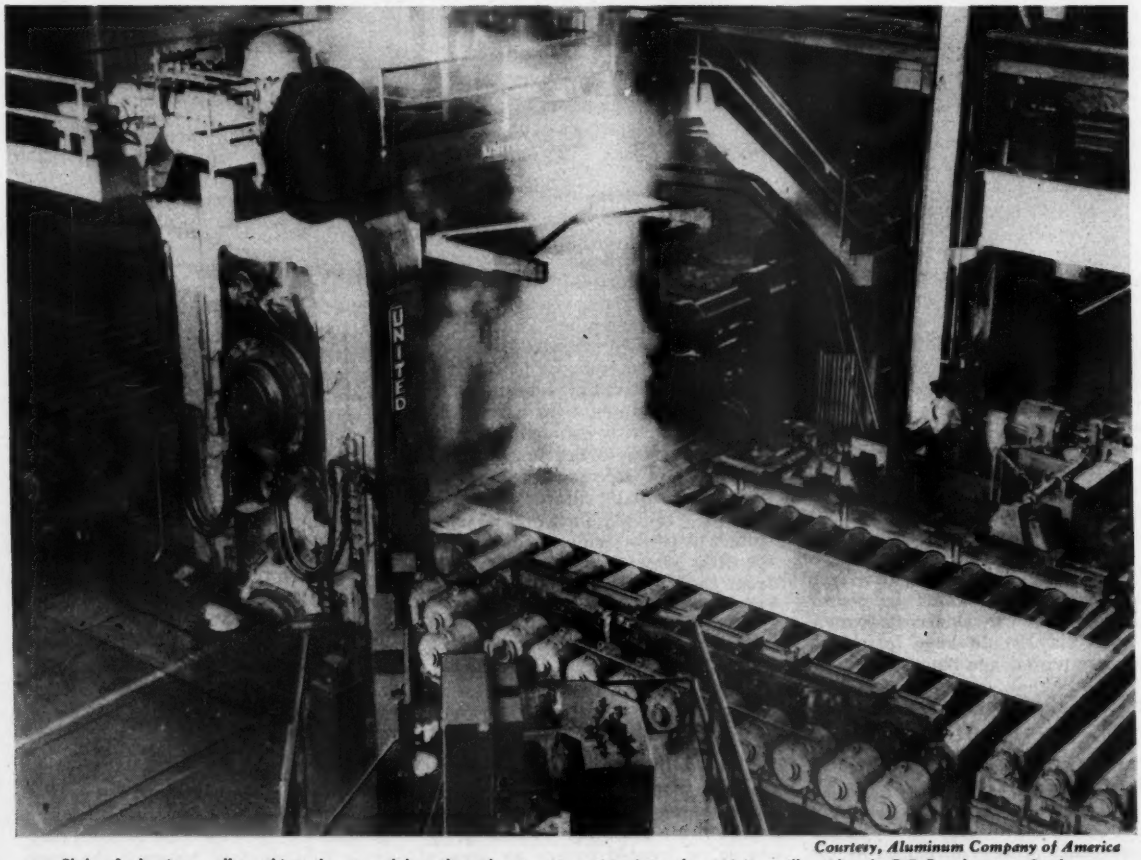
Average thickness of the deposits is about 11 ft. and overburden (silt) ranges from 1 to 30 or 40 ft. The average ratio of overburden to ore is moderate—perhaps less than 2 to 1, although insufficient drilling has been done, particularly in the southern part of the area, to predict stripping ratio of all deposits.

The relatively low silica in these deposits is attractive in comparison with the clays. Also it is reasonable to assume that in treating these deposits pig iron could be produced as a by-product, and a market exists in the Northwest for a fair amount of pig iron.

Conclusion—Home Sources Preferable to Foreign

Among all the costly lessons brought home to us in this war, perhaps the one which stands out most clearly now is the extreme hazard of depending on foreign sources of raw materials required in war production. In any future war emergency, no time will be allowed this country to build up supplies, develop processes, or adopt substitutes. If we are to survive, we must not forget this lesson. Always in the future we should have available in this country adequate supplies of mineral war materials, either readily available in the ground or stockpiled on the surface.

It is certain that, when peace comes, there will be strong pressure on the Government and on public opinion to relax war mineral investigations started under the stimulus of war conditions. There will be the natural feeling that Government spending should be cut to the bone, but there should not be indiscriminate cuts, and some of these investigations should be continued until all the answers on treatment are obtained, because of the essential need of becoming as nearly self-sufficient in raw material supplies as nature and science permit. The alumina-from-clay investigations are among the most important of these, and should be carried on until exact operating knowledge on a commercial or semi-commercial scale is obtained. This is a matter of national security and one the merits of which



Courtesy, Aluminum Company of America

Slab of aluminum alloy, thinned out and lengthened prior to going into the 112-in. mill. Alcoa's D.P.C. plant at Spokane

should be judged from a national security standpoint and not from that of comparison of production costs with imported bauxite. At some future time the costs to business and the country as a whole of depending on foreign bauxite might be many times a present-day subsidy on clay treatment plants; such costs might even be translated into the loss of a war.

In the Northwest, the need to develop sources of alumina other than high-grade bauxite is especially important. Five aluminum reduction plans, together with a sheet mill, have been built, and their post-war operation is of great concern to the aluminum operating companies as well as to people of the region. Operating conditions of the reduction plants competitive with other parts of the country are especially favorable except for alumina supply. Probably a part of this supply can be obtained economically from the Oregon bauxites, but from a long-range standpoint as well as that of national insurance, Northwest clays or other aluminum silicates should be a primary source. Large-scale testing work should be continued until a commercial process has been worked out. It may very well be that if markets for by-products obtained in such a process could be developed, alumina produced on a commercial scale would be competitive with alumina hauled across the country, or even with alumina from a local Bayer plant treating imported bauxite.

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[1] Pacific Northwest Opportunities; Bonneville Power Administration (1944).

[2] Archibald and Jackson; Alumina from clay by the lime-sinter method; AIME, Metals Technology, T. P. 1706, August, 1944.

[3] Flow sheet not published; probably similar in principle to U. S. Bureau of Mines process as given in War Minerals Report 102.

[4] Edwards, Frary, and Jeffries, The aluminum industry, McGraw-Hill Book Co., New York, 1930.

[5] Wilson, H. and Treasher, R. C., Bulletin 6, Oregon Dept. of Geology and Mineral Industries, 1938.

[6] War Minerals Report No. 175, U. S. Bureau of Mines.

[7] War Minerals Report No. 8, U. S. Bureau of Mines.

[8] Nichols, R. L., Preliminary Report on the Molalla High-Alumina Clay Deposits near Molalla, Clackamas County, Oreg., open file, U. S. Geological Survey, Washington, D. C.

[9] War Minerals Report No. 242, 1944.

[10] War Minerals Report No. 263, 1944.

[11] Wimmler, Iverson, Lorain, Oscarson, and Ricker, Exploration of five Western clay deposits, AIME, Mining Technology, T. P. 1739, Sept., 1944.

[12] According to a method used by the U. S. Bureau of Mines designed to give a measure of the amount of alumina and ferric oxide extractable by sulphuric acid processes as distinguished from total alumina obtained by standard chemical analysis. Total alumina would be several percent higher.

[13] Op. cit. (T. P. 1739).

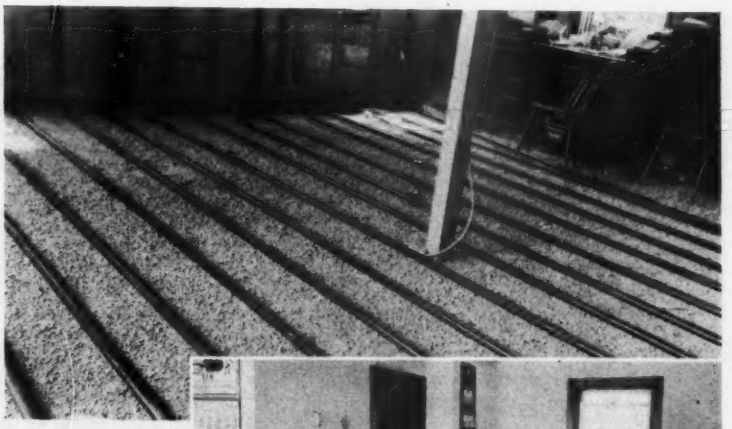
[14] Fowler, K. S., The anorthosite area of the Laramie Mountains, Wyoming: American Journal of Science, Vol. XIX, pp. 389,390, 1930.

Editor's Note: The April "Mining Congress Journal" will carry an article by C. K. White, engineer for Columbia Metals Corporation, describing the alumina-from-clay plant at Salem, Oreg. This is the plant referred to in the above article. Mr. White's paper will be the first information given to the public on this $5,000,000 D. P. C. plant.

Warm Floors Shown to Be of Great Advantage in Columbia, Pa., Radiant Heat Installation

WITH public interest in radiant heating mounting rapidly, Mr. N. K. Musser, coal jobber of Columbia, Pa., decided to put the system to a test in his new office building. The system, he says, is performing excellently and has successfully passed through one complete heating season.

Radiant heating in Mr. Musser's cinder block, basementless office consists of 515 ft. of black wrought iron pipe coils imbedded in the concrete floor slab. The floor construction consists of 6 in. of underfill covered with a 4-in. concrete slab. The coils are positioned on this slab and then covered with another 3 in. of concrete, stained red, which serves as office floor.



Above: Wrought iron pipe floor coils, laid as shown, are later covered with a concrete slab stained red for decorative effect. This pipe has virtually the same coefficient of expansion as concrete, thus minimizing possibility of cracks in the floor

Above: Interior of Columbia, Pa., coal yard office. By eliminating radiators and registers, the concealed radiant heating permits 100 percent use of floor and wall areas

Hot water for the concealed radiant heating system is furnished by a conventional American Radiator jacketed boiler (WC 923). The stoker is the Link-Belt bin-feed, automatic ash pit type (Model 52-67-L). The system makes use of a Thrush circulator (Type NI) and a simple wall-type Minneapolis Honeywell thermostat.

Mr. Musser states that radiant heating lends itself to coal-fired heating plants and that the results achieved in his own installation have been responsible for a continuing flood of visitors anxious to see the system in operation.

"Most interesting fact to these visitors," explains Mr. Musser, "is that there is no apparent heat source. Not only is the system completely concealed, but the floor temperature is below body temperature and does not feel hot to the touch."

Principal advantages of radiant heating, according to A. M. Byers Company, Pittsburgh, which has pioneered the revival of the 2,000-year-old system in this country, are: (1) improved cleanliness; (2) virtual elimination of drafts; (3) complete concealment; (4) warmer floors than in conventionally heated structures; (5) differential in air temperature at floor level and at ceiling level held to 2 or 3 degrees; (6) fuel savings of 15 percent to 30 percent when compared with other heating systems.

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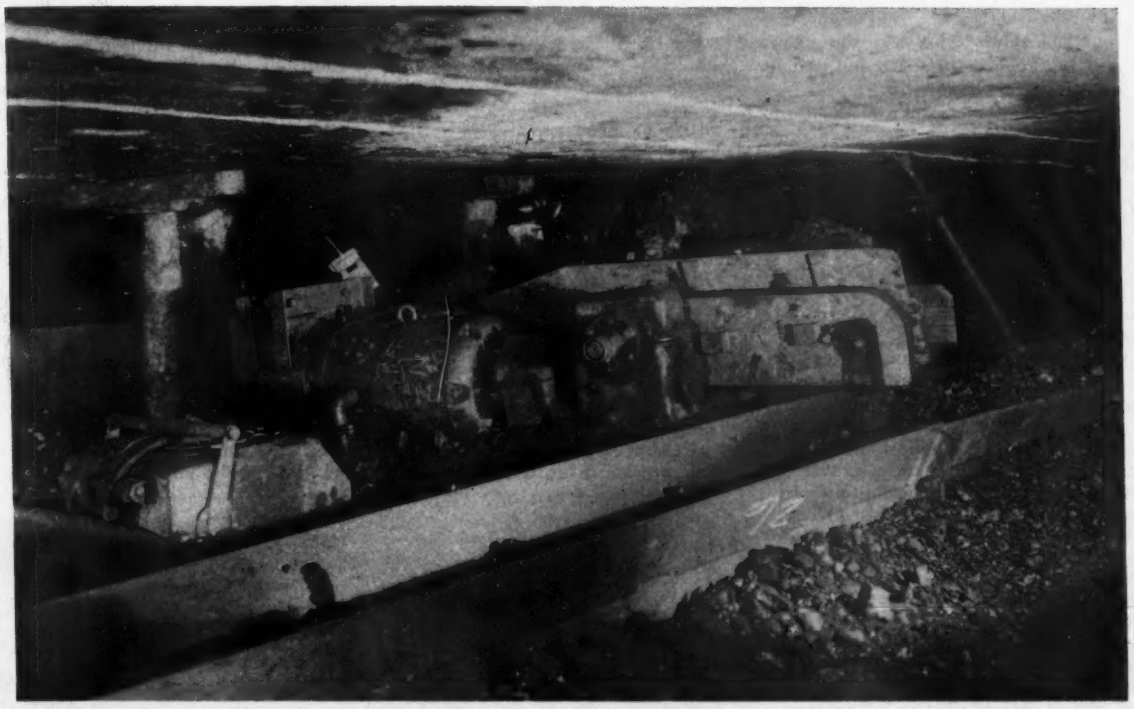
MECHANIZATION In Thin Coal



The development of the chain conveyor as a means of transportation has helped thin seam mining greatly

Thin Seam Coal Mine Operators Have Mastered Many Troublesome Problems But They Continue to Forge Ahead With New Ideas for Improvement

By CAREL ROBINSON
Robinson & Robinson
Charleston, W. Va.

IN the early twenties, when the depression in the coal business overtook the industry, most of the mines in West Virginia were on a hand-loading basis. A majority of the mines operating in thin seams were forced to shut down. When on a hand-loading basis, they simply could not stand the labor cost in competition with mines operating in thick seams.

In the late twenties, and continuing into the thirties, an intensive program of the mechanization of mines in thin seams was instituted. Chain conveyors, shaker conveyors, room belt conveyors, duckbills, and loading machines loading into chain conveyors were introduced in sizable proportion. A number of mines began the use of belt conveyors in room entries and a few used them on the main entry to solve the problem of mainline transportation.

Through this mechanization program, by the late thirties, a great many mines operating in thin seams were producing coal at a lower cost than that being obtained from mines in thick seams, which were on a hand-loading basis. A few, which took the fullest advantage of the opportunities in mechanization, began to produce coal at a lower cost than mines operating in thick seams, which were mechanized, but which had not yet fully utilized all of mechanization's possibilities.

Since the middle thirties the thick seam mines have forged ahead with mechanization and thin seam mines are again at a disadvantage.

The natural handicaps suffered can, and must be, reduced in order for them to continue large scale production when the market is again normal. The most serious of these handicaps are the following:

1. Labor supply.
2. Cost of headroom and clearance.
3. Cost for the delivery of supplies, and moving.
4. Cutting, drilling, and loading.
5. Transportation.

Presented to the Annual Meeting of The West Virginia Coal Mining Institute, November 24, 1944.

Labor

One of the most serious handicaps is labor supply.

At present there is a shortage of labor in all of the coal fields of the country, whether the coal seams are thick or thin. This shortage, however, is much more acute and serious in thin seam mines.

Since the wages paid are essentially the same as for men working in thick seams, the extra burdens incident to working in thin seams must be removed or reduced. The first of these is headroom and clearance to facilitate travel.

All of us have frequently heard men say that they would rather do a day's work than walk to where they work. While this is an exaggeration, it calls attention to a serious feature.

A few days ago I rode in a mine car to the active section of a mine working in thin coal. The motorman urged me to lie on my stomach with my head in the direction of travel. I wanted to see the roof condition, etc., so instead of obeying the motorman, I lay on my back in the bottom of the car and traveled feet first. I soon learned why the motorman had urged me not to travel in that position. There was clearance of only about 3 ins. between the top of the car and the headers, and possibly 8 ins. between my middle and those headers; so, due to optical illusion, as we traveled it looked as if I would be struck by each header, or at least my belt would be snagged.

I continually checked the clearance and tightened my belt twice, but was not able to overcome the optical illusion. I finally unbuckled the belt to make sure that it would not be caught by a spike or large splinter from a broken header. When at the edge of the production section, duck nests had been shot out in the roof and I had clearance enough to get out of the car. Frankly though, I was limp and wet with sweat from the ordeal. After resting and cooling off, I climbed in a rubber-tired shuttle car and traveled head-first to the loading sections.

Plans at this operation are being considered to provide rubber-tired man-trip cars and I made up my mind not to enter that mine again until they are installed.

While, of course, the men entering this particular mine every day get used to the travel, nevertheless, every day energy is consumed by the discomfort incident to riding in the bottom of a car with steel wheels and with no cushioning effect from springs.

A number of companies are designing comfortable man-trip cars with springs, and others plan for cars mounted on rubber tires.

Since the recent agitation about travel time, the men in the mines are far more conscious than formerly of the hazards and burdens incident to underground travel. In both thick and thin seam mines it will be helpful to provide manway entrances as close to the working sections as practical. This is of far more importance where the coal seam is thin than where it is thick.

Headroom

While there is a diversity of opinion among capable operators as to the necessity of brushing top or taking bottom to facilitate the transportation of coal, and travel of men, it is our considered judgment that the cost of providing adequate height in thin seam mines is amply justified.

At the May meeting of the American Mining Congress this year, a paper was discussed by an operator who told of his experience in a mine where the coal is 36 in., and overlaid by 36 in. of very friable material.

The procedure at that mine is as follows: drill in the 36 in. of friable material at the same time the coal in the face of an entry or aircourse is drilled. The coal is first shot and then loaded out by a caterpillar-mounted machine. After that, and before the loading machine leaves the place, the friable roof material is shot down and it is loaded.

In this mine the cost for loading coal, plus the cost for loading rock to provide headroom and clearance, is approximately equal to the cost of loading coal in the rooms where headroom is not taken. In the rooms the coal is loaded by hand on conveyors and the friable roof is supported by fore-poling and the use of heavy crossbars.

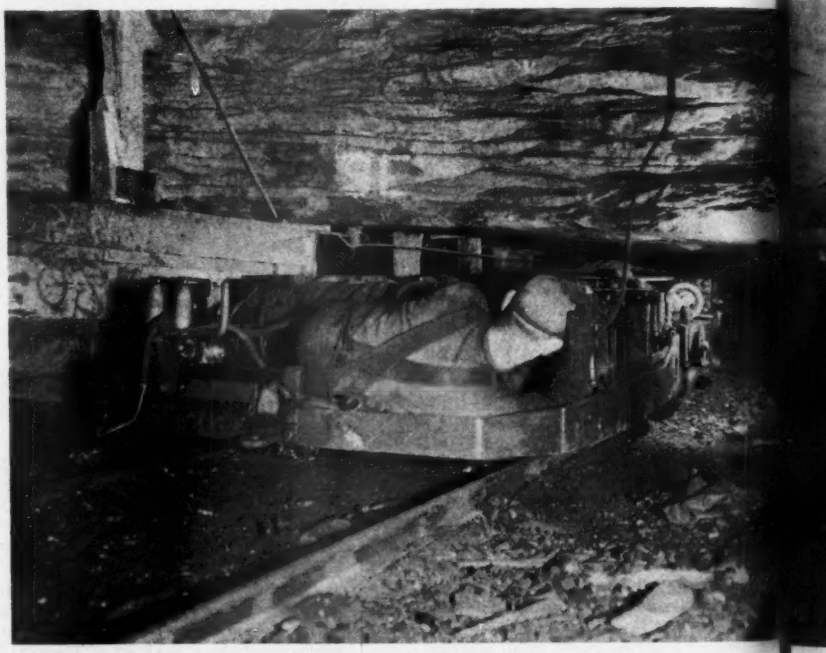
Admittedly this does not represent the average mine in thin seams. At the same time, there are a number of mines which would do well to apply this method of providing headroom and, at the same time, reduce cost.

A number of mines are using a three-drum hoist and scraper. At others, machines designed specifically for metal mining and hence of extremely rugged construction, are in use.

The problem of providing adequate headroom in thin seam mines, as stated before, is of vital importance. Manufacturers would do well to concern themselves with this problem a great deal more than they have done in the past.

In any analysis of the cost of brushing top or bottom, full and weighty consideration should be given to the fact that when adequate headroom is provided, the higher management, from the mine foreman to the general manager of the company, will inevitably spend a great deal more time in the actual working faces and will thereby tremendously improve the efficiency of the working force.

In thin coal the delivery of timbers, conveyor pans, etc., to the working face in many mines is extremely costly



A low vein bottom cutter requires but little headroom on its way to the face

and is excessively burdensome to labor.

One method now being adapted is to use a two-drum hoist mounted on a caterpillar truck. The hoist is brought to the mouth of the working place, and by means of a sheave arrangement at the face all material necessary for use at the face can be pulled there by electric power. This same unit can be used effectively for the recovery of timbers. This same unit can be used to drag out cutting machine, face conveyors, and room conveyor pans in units of 10. This unit is, as of today, probably the most versatile on the market.

There is no reason, however, why low vein supply trucks cannot be developed, which will be capable of delivering under their own power supplies to the working faces.

A number of very clever methods of moving and handling supplies have been evolved, which utilize to the fullest the equipment used in the individual room. For the operators who evolve these methods, due credit must be given. At the same time it is considered that they, at best, represent only an intermediate step, and power driven equipment must be evolved and then used for this vital function.

A duckbill-shaker system permits simultaneous co-ordinated cutting, drilling, shooting, loading and transportation

Machine Cutting

Naturally the per ton cost of machine cutting varies with the thickness of coal in the seam. The present serious handicap can be substantially reduced.

In most mines more than half of the labor incident to cutting is the removal of all bug-dust. This is especially serious in thin seams. One of the manufacturers has evolved a bug-dusting attachment which eliminates entirely all of the shoveling behind the cutting machine and the subsequent bug-dusting operation. Incidentally this pushes the machine cuttings into the bottom of the pile and less coal dust is released into the atmosphere than when shoveled.

A manufacturer has developed a hydraulically operated tilting pan which permits virtually instantaneous guiding of the machine when it is cutting either too high or too low.

In many thin seams where the roof is fragile, blasting damages it excessively. Until recently little could be done about this as there were no low top cutting machines on the market, and which were of a price to permit their use in a conveyor face. Two of the manufacturers have recently brought out low top cutting post-war cutting machines. They definitely offer still unexplored possibilities of tremendous import to operators in thin seams, with poor roof.

Transportation

On an average, the haulage distance per million tons of coal produced is materially greater where mines are operating in thin seams than where the coal is thicker. The cost of haulage, however, can be materially reduced by the use of proper equipment. Where there is ample headroom and clearance, the tracks can be laid with heavy steel and large cars can be used.

There are also marked opportunities for saving in transportation cost by the use of belt conveyors in room entries, and also for main haulage.

Post-War Jobs for Manufacturers

During the present emergency it is generally considered better for manufacturers to concentrate on producing the present models. After the emergency, however, operators of thin coal seams require technological advances. For illustration, a few of these are mentioned:

Metallurgical companies should develop better steel or alloys for machine bits and for drill bits.

For moving mining machines, small ropes with greater tensile strength, and which will permit smaller sheaves should be provided.

Light alloy conveyor pans and chains should be provided. The chains should have greater tensile strength than those now in use.

Light alloy headers should be developed. Before the war the Pittsburgh Coal Company, and others did a lot of useful development work along this line. That program, has of necessity, been bogged down, but should be pressed further when the present emergency has passed. This will be especially useful in thin seams where headers are required and where equipment is provided for the recovery of the headers.

Improved bolts for conveyor pans should be provided. This may involve a coarse thread that can be tightened quickly and reduce the present slow process.

Where headers are used it is burdensome labor for a man to hold them against the roof while one or two other men set posts under the header.

At one mine a home-made timber setter has been constructed. This consists of a hydraulic jack, mounted on a rubber-tired vehicle. Headers placed on this jack are raised up to the roof and held in place. This vehicle is equipped with a power driven saw, which quickly cuts the posts to the proper length. I am told that, by this arrangement, the mine has overcome its handicap in cost of timber setting, both in cost per timber and in cost per ton.

Low portable timber setters and power saws should be developed on a commercial scale by one or more of the mining machinery manufacturers.

Mining machines for use, especially in thin seams, should be designed to carry the bug-dust to the back of the machine and deliver it to a bug-duster. At present only one of the machines is designed for this.

Poor illumination is a burdensome feature of work in all mines and this is especially true for work in thin seams. Arrangements for suitable illumination in the active places, probably indirect lighting, should be provided. If this is good enough it will reduce the burden incident to a belt and battery that must be carried continuously by all of the workers at the face.

A better machine jack, and of more importance, a lighter, quicker acting roof jack should be developed.

An improved fog-nozzle arrangement to atomize the water, or compound, and settle dust in the mine atmosphere, should be provided. With especially clean water very good results are being obtained with those now available; there is, however, a serious loss of time when the water is contaminated by small solids.

Blowers and Tubing

Small portable blowers and tubing were used extensively and proved helpful in many mines, but not in others. Their use has been frowned upon by the United States Bureau of Mines. In West Virginia their use has been prohibited by the Department of Mines.

The objections were based on performance records and hazards. These hazards, though, can readily be made less than the safety features. Then mine operations will be benefited by the quicker removal of smoke and dust from the faces, and a reduction in the number of breakthroughs required. That will save in the cost of loading coal and building stoppings.

Along haulways it will reduce the loss of air through stoppings.

Safe use can be attained by a proper code as was done with other features which otherwise would involve danger; for example: the use of electricity, drilling and blasting, hoisting men, etc. The manufacturers can supply safety devices required by a proper code.

In most mines marked improvements can be made as a result of proper time studies. At present, where a number of men work as a gang, there is a lot of needless loss of time. Some men keep moving continuously, but slower and much less effectively than they should. Proper time studies will reveal the amount of work that can and should be done by each man, and then the work to be done by each man can be planned and coordinated with that of the others.

Result of Improvements

At the first superficial glance it would seem unreasonable to expect a mine working thin coal, 30 ins. for example, to compete with a mine operating in coal 60 or 90 ins. thick. A careful analysis, though, shows that it can be done.

Freight and normally more than two-thirds of the other elements entering into the delivered cost of coal are not affected at all by the thickness of the seam. Some of the costs that are affected are changed only slightly; for example: cost for fire bossing is increased a little, but cost for stoppings is reduced and, of more importance, the loss of air in the ventilating current from leakage is less, because of the reduced area of the stoppings.

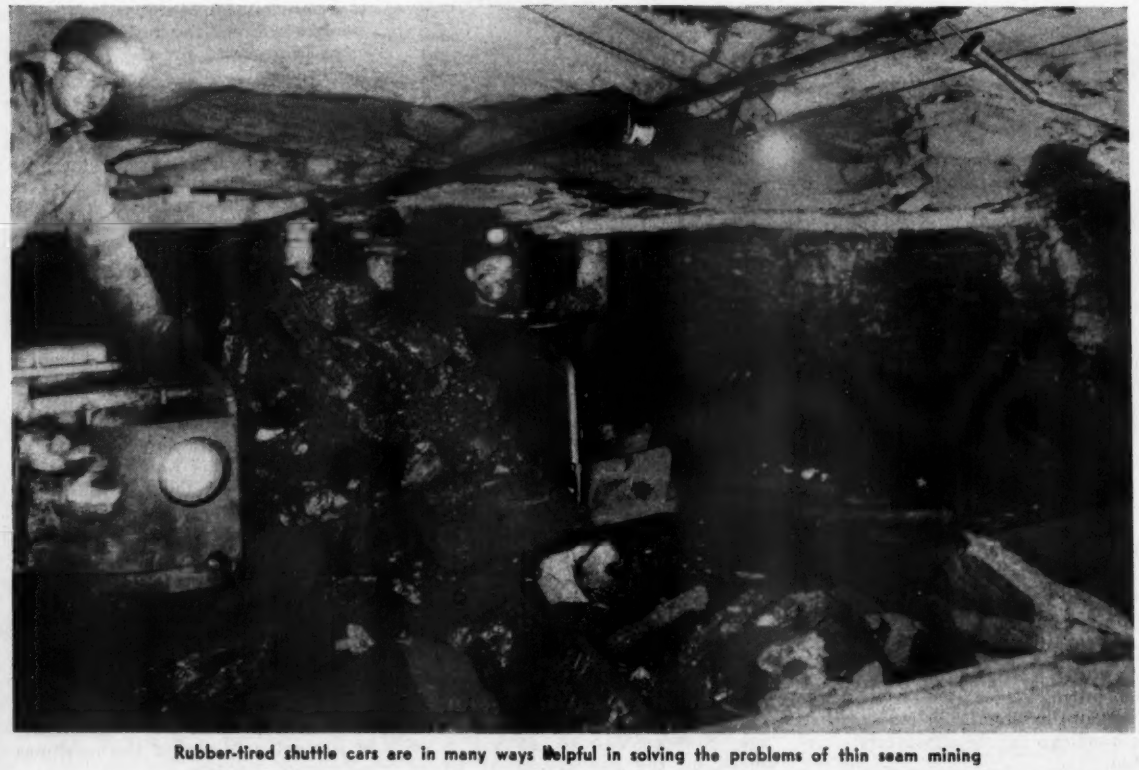
General administration, accounting, and coal sales are not affected.

Handling and preparation costs are not increased. Frequently they are lower because generally there are less free impurities in the thin seams selected for mining than in thick seams.

Thin seams, if properly selected and equipped, can successfully compete. The general manager, though, and the engineer must not be the type preferred by Julius Caesar, when he said:

"Let me have men about me that are fat;
Sleek headed men and such as sleep o'nites
Yon Cassius has a lean and hungry look;
He thinks too much: Such men are dangerous."

The officials of a successful thin seam mine must have alert, hungry minds and Think and Think and Think.



Rubber-tired shuttle cars are in many ways helpful in solving the problems of thin seam mining

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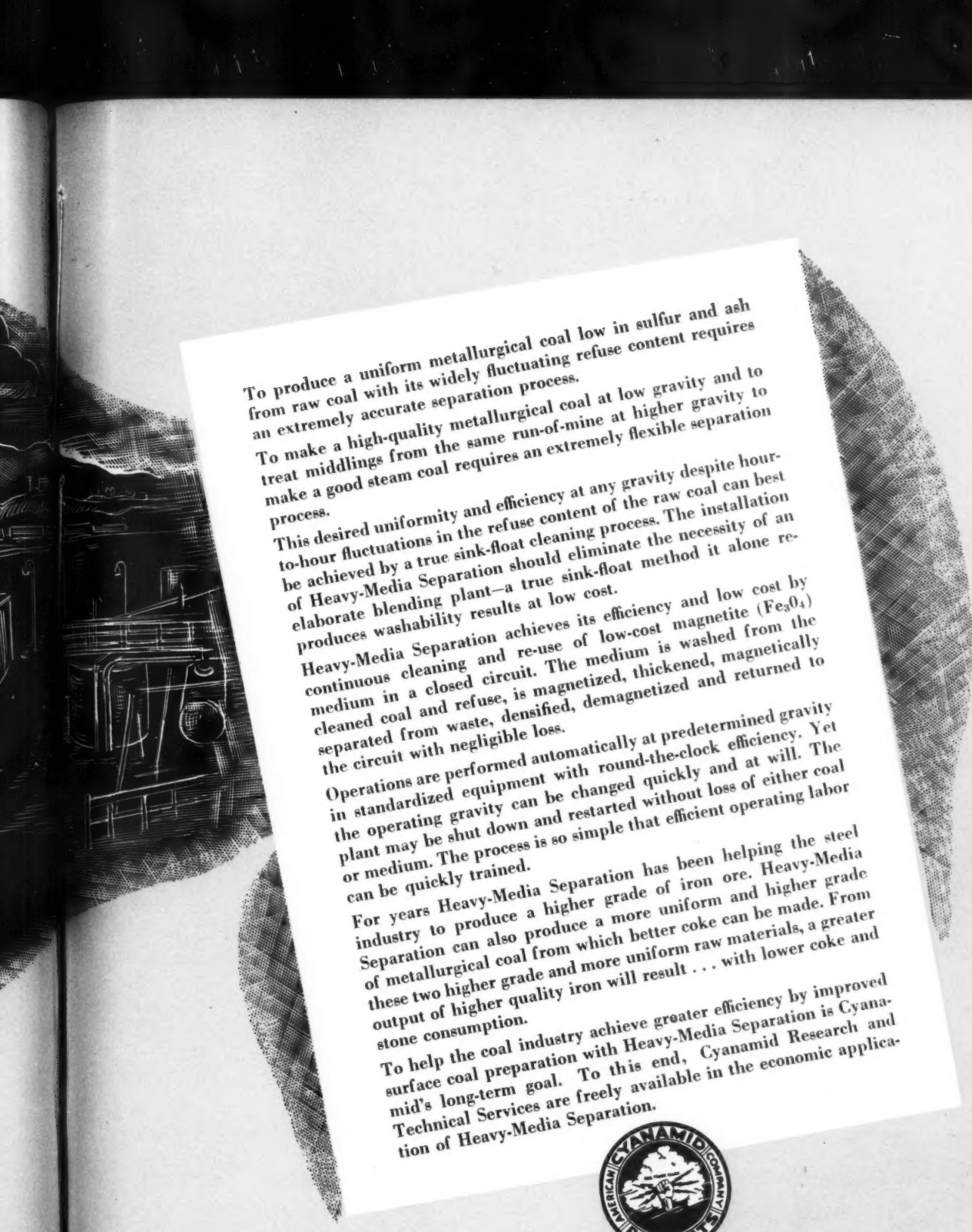

To produce a uniform metallurgical coal low in sulfur and ash from raw coal with its widely fluctuating refuse content requires an extremely accurate separation process.

To make a high-quality metallurgical coal at low gravity and to treat middlings from the same run-of-mine at higher gravity to make a good steam coal requires an extremely flexible separation process.

This desired uniformity and efficiency at any gravity despite hour-to-hour fluctuations in the refuse content of the raw coal can best be achieved by a true sink-float cleaning process. The installation of Heavy-Media Separation should eliminate the necessity of an elaborate blending plant—a true sink-float method it alone re-produces washability results at low cost.

Heavy-Media Separation achieves its efficiency and low cost by continuous cleaning and re-use of low-cost magnetite (Fe_3O_4) medium in a closed circuit. The medium is washed from the cleaned coal and refuse, is magnetized, thickened, magnetically separated from waste, densified, demagnetized and returned to the circuit with negligible loss.

Operations are performed automatically at predetermined gravity in standardized equipment with round-the-clock efficiency. Yet the operating gravity can be changed quickly and at will. The plant may be shut down and restarted without loss of either coal or medium. The process is so simple that efficient operating labor can be quickly trained.

For years Heavy-Media Separation has been helping the steel industry to produce a higher grade of iron ore. Heavy-Media Separation can also produce a more uniform and higher grade of metallurgical coal from which better coke can be made. From these two higher grade and more uniform raw materials, a greater output of higher quality iron will result . . . with lower coke and stone consumption.

To help the coal industry achieve greater efficiency by improved surface coal preparation with Heavy-Media Separation is Cyanamid's long-term goal. To this end, Cyanamid Research and Technical Services are freely available in the economic application of Heavy-Media Separation.

AMERICAN CYANAMID COMPANY PRODUCTS

30 Rockefeller Plaza, New York 20, N. Y.

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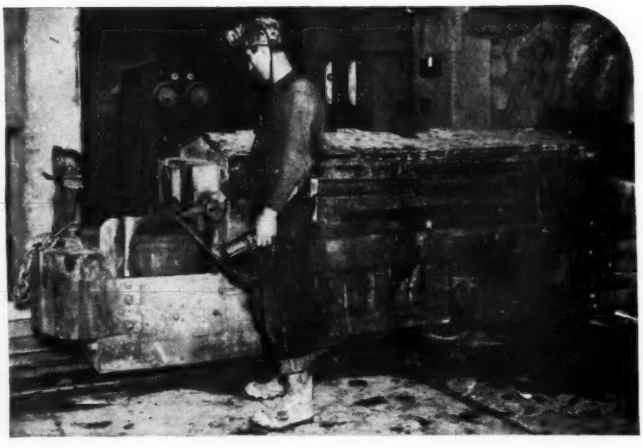

AMONG the time- and cost-saving advantages of powering locomotives and shuttle cars with Edison Alkaline Batteries is the relative ease and speed with which they can be recharged. No critical adjustment of charging rates is necessary. Hence they can be charged direct from the d-c power supply through relatively inexpensive resistors and without the need of motor-generators. They can be fully charged in as little as 6 to 7 hours, thus making it relatively easy to do all charging during off-peak periods, and correspondingly reducing maximum demand.

Alkaline batteries also give you the additional operating advantages listed at the bottom of the page. These advantages explain why alkaline batteries are so dependable, give longer service life than other types of batteries, and are so economical. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey.*

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ALKALINE BATTERIES

In Mine Locomotives and Shuttle Cars Alkaline Batteries Give You These Important Advantages

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- They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- They can **stand idle indefinitely** without injury, without attention, and without expense.

The folded unit is readily tucked away in the automobile trunk when not in use

Fold-Away Conversion AMBULANCE UNIT

Facilities for Handling Injured Persons are Now Available in a Simple Unit Applicable to Standard Two-door Sedans

The clamping plate is attached to the tonneau floor at a point close to the back seat

By WM. EATHORNE

Mining Engineer
Safety Division, Bureau of Mines
Albany, N. Y.

UNDOUBTEDLY many lives have been lost and many persons have been maimed or seriously handicapped for life because they were not hospitalized soon enough after an accident occurred; in many cases, the delay was caused by lack of ambulance facilities.

The seriousness of an injury is seldom definitely known until a thorough examination has been made, and this can be done only at a hospital where X-ray equipment and other necessary facilities are available. Any delay in hospitalizing an injured person is therefore very serious. To get him to a hospital expeditiously and in the safest manner possible, an ambulance is a very necessary piece of equipment, and if one is not readily available, valuable time may elapse before he is hospitalized.

Delay May Be Serious

It is well-known that serious delays in obtaining an ambulance do often occur, particularly in the mining industry, because a large number of our mining operations, through no fault of their own, are in sparsely populated areas, far from hospital or ambulance service. A few of our larger mining companies maintain their own hospital and ambulance at, or near, the scene of their operations, but at many smaller mines neither is available.

The distance between the hospital and the mine is not such a serious matter if an ambulance is immediately available, but where such equipment has to travel a considerable distance before it can pick up an injured person, delays are to be expected. Furthermore, there may be only one ambulance within easy range, and it may be out on another call when it is urgently needed at the mine. Where more than one person is injured in an accident, one ambulance may not be adequate to handle them all. At many of our smaller mines where first-aid training has not been given, they will

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probably bundle the injured person into an automobile and rush him with all speed to the hospital, thinking by so doing that it is the right thing to do, and entirely ignorant of the fact that a serious injury may have been aggravated because of their foolish act.

Application

With the foregoing thoughts in mind, it is believed that the following description of a factory-made, fold-away conversion ambulance unit, such as is now in use at a large mine in New York State, will be of interest to mining officials throughout the country, particularly in localities where ambulance facilities cannot be obtained immediately.

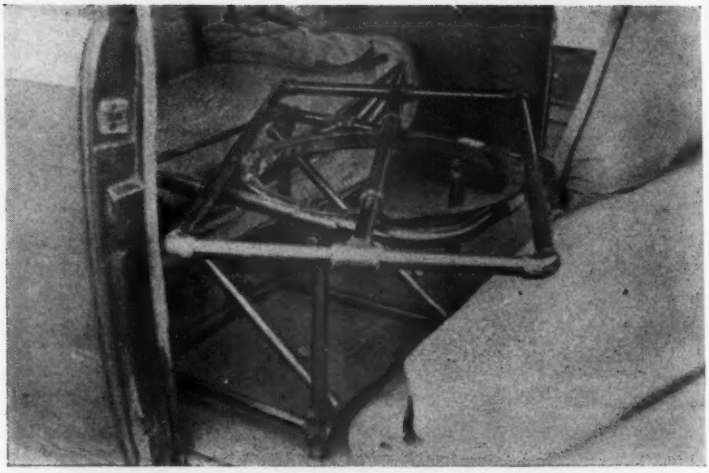
The convertible ambulance units (two are available at the mining operation mentioned) were obtained because the nearest available ambulance is about 26 miles from the property. Furthermore, when hospitalization for an injured employe is deemed necessary, he has to be taken to a hospital about 28 miles away, in the opposite direction from the ambulance station. It will be readily seen that this ambulance has to make well over a 100-mile trip whenever its services are required by this mining company. Under such circumstances it is obvious that much time is necessarily lost before the injured are hospitalized; in addition, considerable expense is involved when an ambulance has to make such a long run.

Description of Unit

The unit in use is designed for installation in any conventional two-door sedan by changing the factory assembly of the hinges on the right front seat-back slightly to make the seat-back easily and quickly removable, and also attaching a small plate (fitted with a bar and clamps) to the tonneau floor by means of small bolts. The clamping arrangement serves as an anchor for the unit and can be installed close to the back of the right front seat or close to the front of the right back seat. These changes are so simple that the services of a skilled mechanic are not essential, and they should not take much over half an hour. Neither change will cause any inconvenience when the automobile is used for ordinary purposes, and they are not likely to be noticed unless specially drawn to one's attention. As many additional clamping plates as desired can be obtained, making it easy to have one or more automobiles always in readiness for use as an ambulance.

Unit is Light and Small

A unit consists of a table and cot, the main framework of both being constructed of 1-in. tubular steel with an attractive gunmetal finish. Both



The back of the right front seat has been removed and table top put in place to swing into suitable position to receive the cot

Cot is in place on the table before being swung into final position

In its final position the foot of the cot is near the instrument panel

table and cot will fold very compactly and can be carried in the trunk of an ordinary automobile.

A complete unit weighs a little less than 60 pounds and is priced at $125 f.o.b. at the factory. The usefulness of a unit is not limited to the life of the automobile, since the parts may be readily taken out and installed in another automobile. Even assuming that one of these units will only be useful for 10 years, which is probably underestimated, the original cost if distributed over this length of time will only amount to about $1 a month, an insignificant amount and truly a bargain compared to the cost of one injury.

The table stands about 16 in. in height when unfolded and is adequately braced to give it strength. The top measures about 18 by 30 in. and is provided with a swivel head which will permit being easily swung horizontally while the table legs remain stationary. The table is firmly anchored to the tonneau floor when the two easily operated hand clamps attached to the anchor plate arrangement are pressed down over one of the two ½-in. tubular braces at the base of the table. The position of the anchor plate will determine which brace is to be used for anchoring.

The ambulance cot measures 36 by 20 in. when folded, and when unfolded it is of regulation size, measuring 72 by 20 in. It has sturdy wirespring cross members and is provided with a pillow and hair felt mattress, both of which are covered with a reversible material which is both water repellent and washable. Two web straps about 2 in. wide are provided for holding the patient securely to the cot. The underside of the cot is fitted with four deeply grooved wheels having an outer diameter of about 2½ in.; these serve as a support for the cot when resting on the table top. The wheel grooves are designed to fit the 1-in. tubing in the table top very snugly, thus preventing side play of the cot when the unit is assembled. End play of the cot is prevented through contact of the grooved wheels with the tubing elbows at the corners of the table top. When assembled in the car the unit is firm and rigid, leaving very little to be desired in the way of ambulance facilities.

The assembly time for one of these units at a demonstration given for the author's benefit was timed and found to be about 3 minutes; the manufacturer, however, states that it can be accomplished in about 1 minute.

Steps for Assembly

The steps necessary for assembling a unit are very simple and can be handled very smoothly by two men.

With head in this position, patient can ride very comfortably. A gentle swing brings cot into place. There is room for an attendant also

The back of the right front seat in the automobile must first be removed and the unfolded table secured to the anchor plate. The unfolded cot with the patient in position must then be lifted head first into the car by way of the doorway at the right. As soon as the head of the patient has passed through the doorway, the cot must be gradually swung toward the rear of the car while advancing of the cot is in progress. Eventually the head of the cot will come in contact with the left side of the car at a point slightly to the rear of the left door; the feet of the patient will now be in the vicinity of the right doorway and not far from the instrument panel. When in this position, the grooved wheels on the underside of the cot will make contact with the table-top frame, and the cot will rest in horizontal position. A gentle swing, assisted by means of the swivel bed, will be all that is necessary to bring the cot to its final position, which is parallel to the longitudinal axis of the car and close to the right side. When the final step is completed, the head of the cot will be practically touching the back of the back seat and the foot will be very close to the bottom of the instrument panel. In addition to the driver of the car, an attendant can sit on the left back seat near the head of the patient, and if deemed necessary, another attendant can kneel on the floor of the car between the driver and the other attendant. The cot and patient are removed from the automobile by adopting a reverse procedure to that already described for placing the cot in position.

The mine where this equipment has been made available has one Ford and two Chevrolet two-door sedans equipped for such units. Another Ford and another Chevrolet of similar type are to be equipped for such units in the near future. All of these cars are owned by key employes who live at the property. The company will soon have five automobiles at its service capable of being used as ambulances and two cot units available for use in them. This arrangement will insure the management beyond any reasonable doubt of having adequate ambulance facilities always within several minutes' call. Very few of our largest corporations can boast of such a guarantee.

Conclusions

In view of the modest original cost and the fact that as many automobiles as may be desired can be converted for use at a small additional cost—thus insuring ambulance facilities at all times without delay—it is believed that no mine, no matter how small, has any justifiable reason for being without its own ambulance facilities. There should be no more waiting for an ambulance when a life is at stake. The usefulness of a unit is not limited to the life of one automobile, since it can be transferred from one automobile to another.

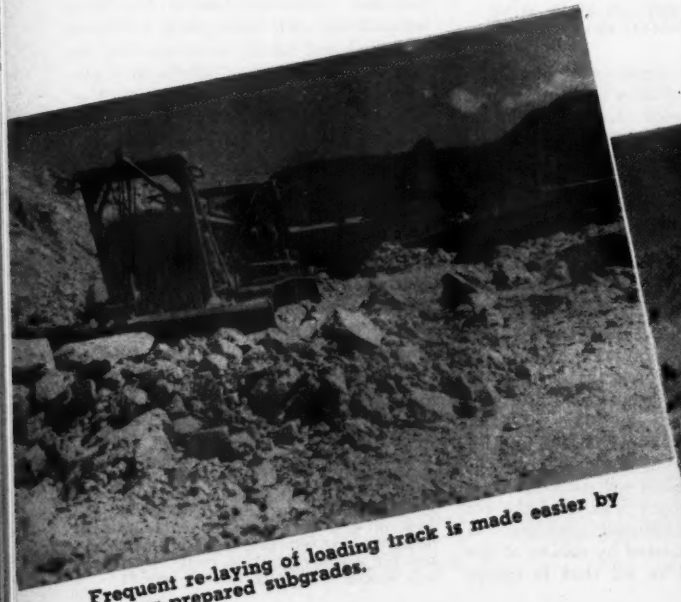
Accidents, no matter how serious or how they may have occurred, are always undesirable for both the injured person and the mine operator. We do not choose to have them; they come unwelcomed; it behooves all concerned to do everything within their power to lessen rather than add to their severity whenever it is reasonably possible to do so.

Acknowledgments—The author wishes to express his grateful appreciation to the personnel of the safety department at the mine where these conversion units are now in use, for their thoughtfulness in bringing this equipment to his attention and for a demonstration in its use which was staged especially for his benefit.

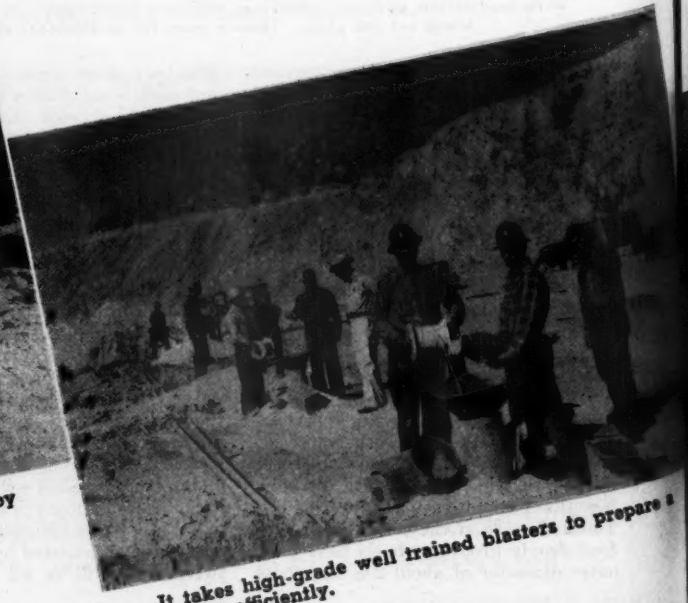
MORENCI IN ACTION!

The most modern drilling, loading and haulage equipment characterizes initial ore-getting operations at this famous Arizona property.

THE American copper mines have contributed greatly to the striking power of industry engaged in all-out war. Despite utilization of every labor-saving technique, however, their greatest need lies in more manpower. With men less and less available, operators face increasing difficulty in keeping our all-important mines going.



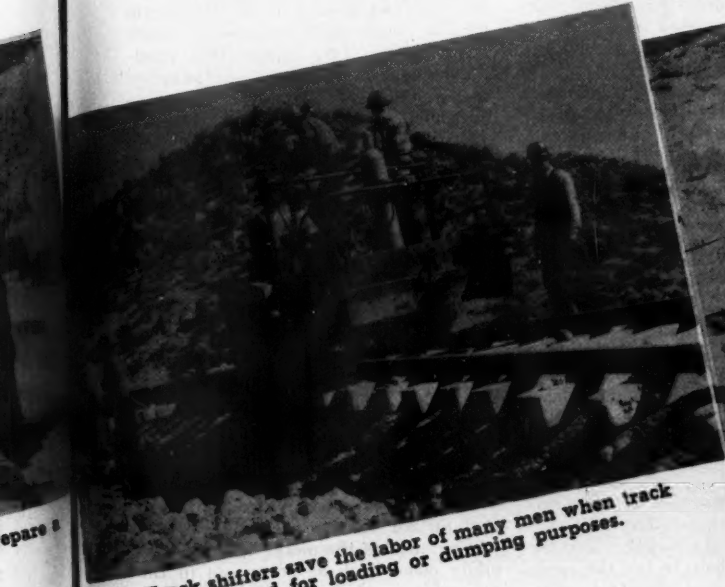
Frequent re-laying of loading track is made easier by bulldozer-prepared subgrades.



It takes high-grade well trained blasters to prepare a big blast efficiently.

Ore must come from many points simultaneously for optimum milling operations. This necessitates a well planned mine lay-out and a top-notch haulage system.

Breaking the tonnage for several shifts ahead in selected spots, is the constant task of the blasting crew.



Track shifters save the labor of many men when track must be placed for loading or dumping purposes.

Track sections are picked up by locomotive type cranes, loaded onto "flats" and transported at will to any other place where track is in immediate demand.

New SOURCES OF ORE In The Western United States*

The Pioneering Spirit, With the Help of Continued Engineering and Technological Progress, is Expected to Maintain National Ore Reserves

By IRA B. JORALEMON

Consulting Geologist
San Francisco, Calif.

ONLY a soothsayer could do justice to the broad subject that has been given me, but geological exploration requires at least the imagination, and perhaps the forgetting of past mistakes that are a necessary prelude to confident prophesy. So perhaps an exploring geologist may be less hampered by facts in his appraisal of the future than one who deals in any of the more concrete aspects of mining. I hope that at any rate the soothsaying may have better than the 1 to 5 ratio of success to failure that constitutes perfect marksmanship in shooting at new orebodies.

For the past two years technical and non-technical publications have been filled with warnings that we are exhausting our natural resources, and particularly metals and oil, at such a rapid rate that the cupboard will soon be bare. It is beyond question that the war-time rate of production of most ores has far exceeded the rate of discovery. If the curves of production and discovery are projected 10 or 20 years into the future, the student of trends cannot help being a Cassandra, crying Woe! Woe! Many conservative engineers and economists have been so overwhelmed by the prospect that we may be caught with no metals for a future emergency that they have advocated the shutting down of most of our domestic mines, and the acquisition of the needed peace-time metal supply from foreign sources. They say the cost of developing domestic sources of ore, largely marginal, will be prohibitive, and the increase in prosperity through a high level of foreign trade due to importation of ores and metals will far more than make up for any injury to our waning mining districts.

There is just enough truth in this line of reasoning to make it dangerous. Mining is certainly a liquidating industry. Every ton of ore mined leaves that much less in the ground. Eventually the reserves of all ores must be exhausted. Furthermore, the ore deposits that outcrop have, for the most part, been developed, and remaining known ore that can now be mined at a profit will last only a few years, or at best decades. The criers of "Woe!" have at least this basis for their lamentations.

Our Reserves are Still High

They forget, however, that the picture is only a little brighter in other parts of the world. We have been using our natural resources more rapidly, but we started with far more than our share of nearly all metallic ores. With only 6 percent of the population, we originally had from 20 to 50 percent of the ores of all the major metals. We still have far more than 6 percent of almost all ores. If the less favored nations are going to make any progress in catching up with our mechanization and standard of living—and such progress is the only hope of lasting peace—they must use up their own resources at a far greater rate than ever before. Their known orebodies can at best outlast ours by a decade or two. If we draw the major part of our copper, iron, lead and zinc from other parts of the world, we may cut down the difference between the time of exhaustion of our known deposits and that of foreign deposits by a few years. But we will accentuate the difference between our comfort and the want that will pervade the rest of the world after the war, and so will help to lay the seeds of another, even more disastrous war.

It is doubtful if such a policy of importing foreign metals and holding our own ore in reserve would postpone the feared scarcity of metallic ores. For the winning of metals from ores depends completely on technical skill, both of planning and supervision and of labor. If our domestic mines are shut down, or production is greatly curtailed, we will lose the trained personnel on whom resumption of mining in time of need will depend. We would then be in the position of an old miner friend of mine who thought he had worked underground long enough, so he bought a little ranch in the Rio Grande Valley near Las Cruces and put up a couple of windmills to pump water to irrigate an alfalfa patch. Unfortunately he found there wasn't wind enough to keep two windmills going, so he tore one of them down.

We don't want to tear down our windmill of domestic metal production when the destruction won't do any good. Fortunately, the situation, both at home and abroad, is far less acute than it seems at first glance. There is at least a fair chance that intelligent use of domestic ore supplies and exploration for new ore may so postpone any scarcity that moderate stockpiles of essential ores or metals may be all the protection we will need.

Secondary Metals Help Our Independence

The growing supply of scrap metal will help greatly in postponing the date of a metal shortage. A comparatively small proportion of most metals is permanently consumed. In the case of copper, for instance, Mr. W. W. Lynch has figured the average time of the round trip from bullion through industrial use and back to bullion again as only 23 years. Metals in use provide a reserve far greater than that in all known orebodies. Even where much of the metal does not normally come back as scrap, as in the case of many uses of lead and zinc,

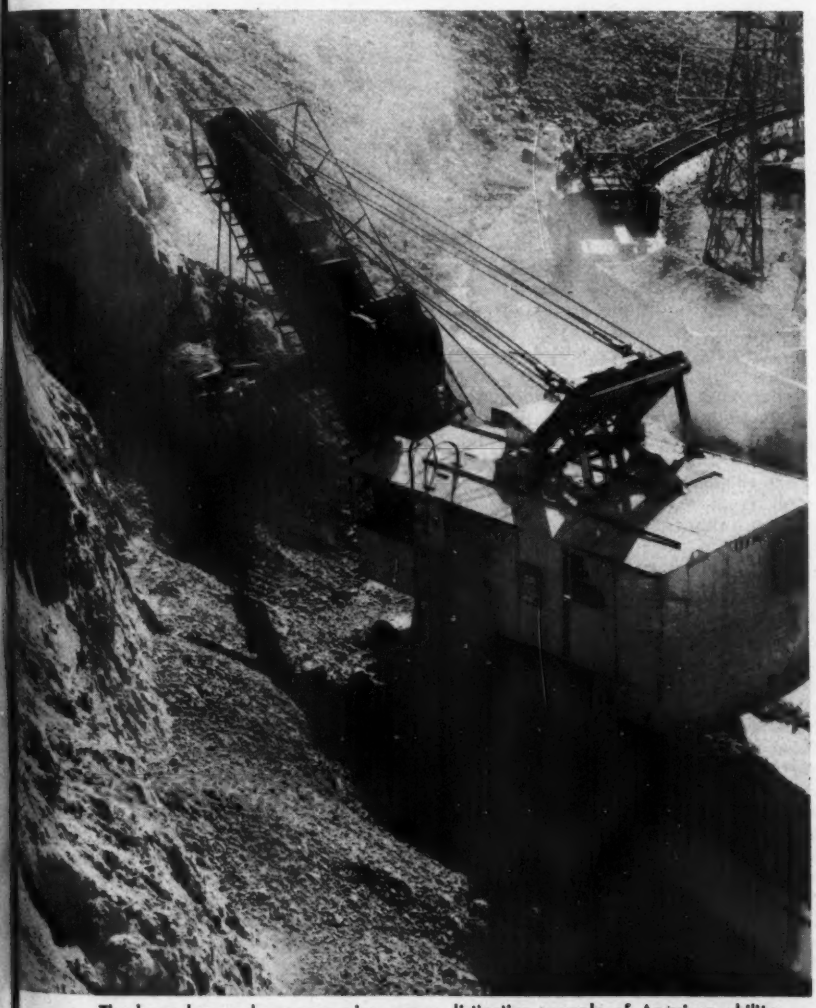
* Presented at meeting of Colorado Mining Association, Denver, January 26, 1945.

there are enormous quantities of the metals in homes and other buildings and in factories of non-essential products that could, in time of acute need, greatly postpone a catastrophic shortage. There is no question but that the long resistance of Germany and Japan, in spite of most inadequate supply of ores of essential metals, has been largely due to relentless confiscation of metal from non-essential uses. Scrap metal will certainly reduce the average yearly quantity of new metal needed to maintain industry at the past level, and will prevent any disastrous shortage during an emergency of reasonable duration.

Technology—Our Greatest Resource

Technological progress is still more important in preventing or postponing any serious shortage. The use of substitutes such as plastics will considerably reduce the quantity of metals required. Light metals of which there is an unlimited source will replace heavy metals of which the ores are more limited. Alloy metals add so greatly to the strength, conductivity or other properties of certain metals that one ton will do the work of many tons. Equally important is the role of metallurgical research in making possible the use of new or lower grade sources of metals. Perhaps the greatest example of this was flotation, which in a few years made recovery from 1 percent copper ore as great as that from 1.6 percent ore had been before, and which postponed an expected shortage of lead and zinc for 20 years through separation of minerals from complex ores. Through flotation, the milling of many ores has reached a point where comparatively little further improvement seems likely. But smelting—the final step in the production of most metal—has progressed little since the time of Agricola, except in the size and mechanical efficiency of units. We cannot say just where technological progress will come, but it will surely continue to make it possible to use new and lower grade sources of ore without any serious increase in cost of production.

In spite of the supply of scrap metal that will be enormously increased by the liquidation of war materials, and in spite of technological progress, in the long run the continued supply of metals will depend on ore. So by a devious course we come back to the subject of this paper. Fortunately the prospect for the development of new sources of metals is far brighter than the pessimists fear. It will not be as easy to find orebodies as it was when the Cornish superintendents looked with such deserved scorn on "them yellow legged sons of so and sos of engineers," but it seems to me that all indications point to the conclusion that we have found only the most evident orebodies. There is lots of ore, especially in these Western states, and all that is needed is the intelligence to find and use it.



The large low-grade copper mines are a distinctive example of American ability to establish new frontiers

Adequate Metal Price Structure Needed

The first and absolutely necessary prerequisite to the development of new orebodies is a metal price-structure equivalent to that in the past. We can find ore, but we can't find ore richer or more accessible than that already mined. Therefore, if miner's wages continue to be $8 to $10 per day, with other costs in proportion, it is out of the question to maintain metal prices of 1925 to 1930, when wages were around $5 per day. Technological advance cannot make up for so great a difference. Still less will it be possible to find ore from which copper, for instance, can be produced and sold for 10 or 12 cents per pound when the average price before 1930 was 15 cents per pound. And 4-cent lead and zinc with $10 wages will mean no lead and zinc. If we are to have a stable mining industry, adequate to produce a proper proportion of the metal needed in this country, average metal prices must be nearly as much above pre-war prices as wages are above pre-war wages. Greater efficiency may take care of part of the increased labor cost, but not a major part.

An equally important prelude to new ore development is a tax structure that will allow sufficient profit on successful ventures to return the cost of unsuccessful as well as successful, exploration, with a margin great enough to make the risk worth while. Without this, exploration must be largely by Government agencies that will become inefficient and unimaginative when the economic incentive to mining is removed, and we won't find the ore.

Better Prospecting Methods

The next pre-requisite will be the use of all scientific methods that can help in foretelling what may be found below the surface. The oil industry has shown the way by its remarkable development of geophysical methods of exploration, that can accurately map structures in sediments that are overlain by 10,000 ft. of unconformable strata. Only the expenditure of millions of dollars in research by the great oil companies has made this possible. Attempts to use geophysical methods in finding orebodies have been on a comparatively insignificant scale. Yet the differences between ore or orebearing rocks and barren formations are usually at least as great as those that point the way to deep oil reservoirs. Great areas that may contain orebodies are covered with comparatively thin layers of glacial drift. The long slopes at the base of desert mountains are often covered by only 10 to 50 ft. of gravel and talus. Orebodies have already been found with the help of geophysical prospecting under such conditions, and with added research, particularly in radar, the risk in prospecting for new orebodies will be greatly reduced. When the need for ore becomes evident, and when the economic climate makes exploration once more profitable, geophysical research comparable to that by the great oil companies should bring results just as spectacular.

Progress in recording and interpreting geological data must precede or go with geophysical research. Thus far, economic geology is only a haphazard and often fruitless study. We have little idea what causes even the great intrusions, to say nothing of orebodies that are many times as complex and mysterious. All that recent geological work has done has been to prove that the theories of the great pioneers in geology are either wrong or inadequate, with no new theories that are accepted by more than a handful of geologists. Geology suffers from the handicap that nearly all the evidence is hidden beneath the surface, but with more careful and widespread recording of data, and with deductions that do not pay blind obeisance to old theories, great progress can surely be made. No branch of science is more in its infancy, and none offers a greater reward to unprejudiced research.

The progress of exploration and of beneficiation of ores in the past few years is the best evidence that ore development in the West has only begun. It also shows the metals for which we can hope to have a continuing source, and those that we must secure from other countries or replace with substitutes.

The Iron Industry

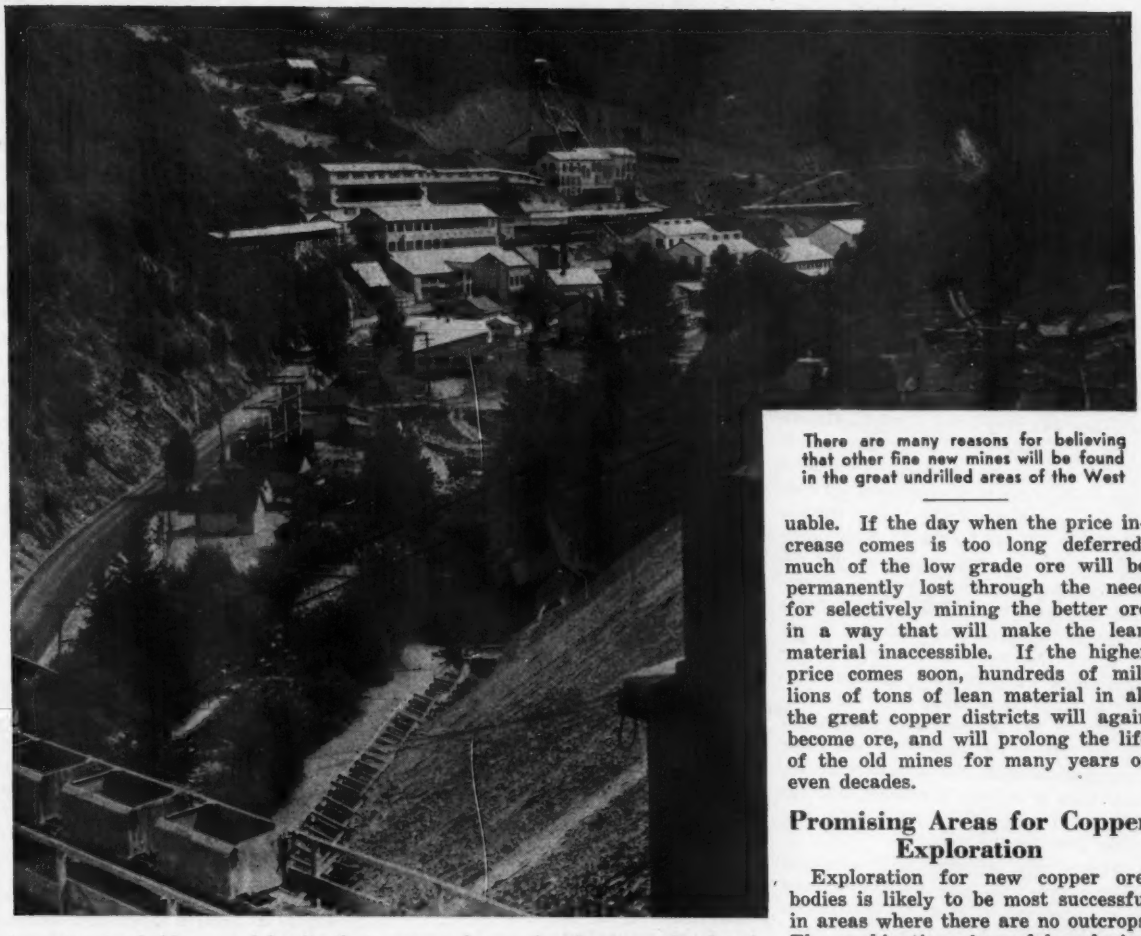
Iron is at the base of mechanical civilization, and the coming exhaustion of high grade iron ore is frequently referred to by the pessimists. It is true that 55 or 60 percent ore of good quality is becoming scarce. But ore of less purity and of slightly lower grade is known to exist in the Lake Superior region and elsewhere in quantities of many billion tons. Washing, sink and float, and flotation have already made commercial tens of millions of tons of 40 to 50 percent ore that can be cheaply mined. The treatment of enormous quantities of hard magnetite ore of similar grade has been almost if not quite perfected, and about all that is needed is to accustom furnace operators to use sintered concentrates. Low grade taconite ores are known in even more inexhaustible quantities, and there is little doubt but that research will eventually find a way to use these ores at a cost little, if any, higher than that of importing high grade ore from Brazil or other distant countries. There are many comparatively small but high grade iron deposits in California, Colorado, Utah and other Western states. It is doubtful if they can be the foundation for long lived iron and steel industries that will compete with the far greater operations dependent on Eastern and Southern orebodies 50 or 100 times as great. But they should be an economical source of wrought iron, unusually pure steels or alloys, using sponge iron or other processes on a comparatively small scale. Such a Western iron industry will depend on superior quality for special uses rather than on large scale, low cost production. Iron is one of the commonest of elements, and if we develop methods that are already in sight there should be no scarcity of iron or steel from domestic sources for an almost unlimited time.

Aluminum

Aluminum is often a source of worry because we must import most of the high grade bauxite from which it is now made. If we were shut off from sea transportation, there would soon be an aluminum shortage, the pessimists say. But aluminum is the third most abundant element in the earth's crust. While 40 percent bauxite ores occur in this country only in relatively small quantities, we have unlimited quantities of other ores that contain 25 to 35 percent alumina, or roughly half this amount of the metal. In the case of any other metal that sells for a comparable price, such ore would be high grade. The anorthosite deposits of Wyoming are measured by the billions of tons. High alumina clay deposits and alunite deposits occur by tens of millions of tons in Oregon and Washington, Idaho, Utah, California, Montana, and other parts of the West. Nepheline syemites are a possible unlimited source of aluminum. All that is needed for the establishment of a permanent Western aluminum industry, independent of foreign ore sources, is the development of economical processes for recovery of aluminum from these comparatively high grade sources. The problem has been solved in the laboratory, and through the foresight of the Aluminum and Magnesium Division, War Production Board, pilot plants of commercial size using five different processes are now under construction, or in operation. While aluminum from these clay or aluminum bearing rock processes cannot at present compete in cost with that from bauxite, experiments are only beginning, and far more unpromising problems have been solved by metallurgists. Fortunately, it is not likely that aluminum from these low grade materials will be needed during World War II. In spite of the present shortage of labor and supplies, the experimental plants are of the greatest possible value to future national defense as well as to the industrial welfare of the West. The War Production Board deserves all possible support in its attempt to keep the clay, alunite and anorthosite experimental plants in operation until at least the most vital questions have been answered. Then private industry should take over the development of a great Western aluminum industry.

Magnesium

Magnesium also occurs almost everywhere, and is the sixth most abundant element. Fortunately, American industry has learned how to make this vital light metal at reasonable cost from sea water, from natural brines, from magnesite and from dolomite. The only question is, which process and source are most economical. Sea water and brines have a little the edge at present, but the others may catch up. The West should continue to produce a great part of the magnesium, particularly where cheap power and fuel are available. Magnesium from sea water will continue to be a great industry in Texas and around San Francisco Bay. Some of the richest magnesium brines known occur in eastern Utah, and brines from Great Salt Lake and other land-locked bodies of water have possibilities. The magnesite deposits of Gabbs Valley, Nevada, are among the greatest known, and only the distance to cheap power and abundant water have prevented them from being one of the cheapest sources of magnesium. Dolomite, which contains more than 20 percent magnesium oxide, occurs in unlimited quantities throughout the West. There are billions of



There are many reasons for believing that other fine new mines will be found in the great undrilled areas of the West

tons of remarkably pure dolomite that can be mined for a few cents per ton within 25 miles of the Las Vegas magnesium plant. While processes for making magnesium from dolomite are now a little more costly than those that use brines or perhaps magnesite, research may overcome this disadvantage. Whatever process wins out, the magnesium industry of the West will be limited only by the uses of the metal, which will certainly continue to expand.

Copper

Coming to the non-ferrous heavy metals, copper, lead and zinc, exploration rather than metallurgy holds the key to the future. In the case of all three metals developed reserves will last only one to three decades at the pre-war rate of consumption. Opportunities for new development are most promising, provided the ratio of metal prices to wages and other costs is about the same as before 1930, and provided the post-war tax structure makes mine exploration worth while.

Many are pessimistic regarding the future of copper in the United States because outcrops are usually prominent, and the known promising outcrops have already been developed. Fortunately, other copper sources seem likely to replace the evident ones.

An overwhelming proportion of the copper mined in the United States comes from 11 great districts. Reserves of ore of a grade that is profitable under present conditions, with $8 to $11 wages and a 12-cent ceiling price for most of the production, is alarmingly limited. But it is unthinkable that the present ratio of costs to price can continue. Development of the great copper deposits took place when wages were $3.50 to $5 per day, with other costs in proportion, and the price of copper averaged 15.9 cents per pound. It was only in the acute depression years following 1930 that the price fell below this average level. Spectacular foreign developments, together with a small demand, were responsible for the average of 9.27 cents from 1931 to 1940. The low price cannot last, as even the foreign mines are skimming the cream from their deposits. When the inevitable happens, and copper returns to a price in keeping with costs, great quantities of low grade material in the 11 major districts will become valuable. If the day when the price increase comes is too long deferred, much of the low grade ore will be permanently lost through the need for selectively mining the better ore in a way that will make the lean material inaccessible. If the higher price comes soon, hundreds of millions of tons of lean material in all the great copper districts will again become ore, and will prolong the life of the old mines for many years or even decades.

Promising Areas for Copper Exploration

Exploration for new copper orebodies is likely to be most successful in areas where there are no outcrops. The combination of careful geological study with geophysical exploration is sure to find many new copper deposits, both on the margins of the great districts and in new areas. Most of the copper mines are in mountain ranges in desert or semi-desert regions. At the base of the mountains the long piedmont slopes are covered by a thin mantle of gravel or conglomerate. The rock formations that contain the ore in the known mines extend out under the gravel, and in places valuable orebodies have been found where no rocks outcrop. Where no profitable deposits have been found, there are often indications of copper mineralization that suggest that the real orebodies may be hidden by detritus or by recent rock formations. Development of the orebodies that do not outcrop presents an almost unlimited field for exploration.

Already enough hidden ore has been found to make the gamble seem attractive. In the great Lake Superior copper district, for instance, over three-fourths of the length of beds of conglomerate and amygdaloid known to be mineralized are covered on surface by glacial detritus. Yet up to a few years ago, practically all of the

many billion pounds of copper produced from the Lake Superior district had come from sections of the lodes that outcropped. In the past 10 years an intelligent campaign of development of parallel lodes hidden by glacial drift, largely guided by diamond drill, has found half a dozen orebodies of great promise. There is a reasonable chance that the "Copper Country" of northern Michigan may again be a contender for a place at the head of the list of copper districts.

The new San Manuel property near Oracle, Ariz., is another example of a hidden orebody. A small outcrop of altered porphyry stained with copper silicate has long been known. On one side is a lean pyritic porphyry hill, and for many miles on all other sides the orebearing rock is masked by beds of recent conglomerate. The Bureau of Mines, guided by the U. S. Geological Survey, in the course of its development of possible sources of essential metals, drilled a few holes through the conglomerate, and found a great thickness of low grade disseminated copper ore. Magma Copper Company has taken over the property, and has started a drilling campaign. It is too early to say how large or valuable the deposit may be, but there is at least a chance that the conglomerate mantle may hide another great copper district.

There are at least half a dozen other places in the desert where there is encouraging copper mineralization in little hills that barely stick their noses above the desert wash. Blind exploration of the areas surrounding these hills would be a reckless gamble. But a combination of geological study, geophysical exploration, and shallow scout drilling should, within a few years, find other great copper orebodies.

The development of vein deposits or chimneys or lenses of ore where outcrops are inconspicuous and oxidation deep, presents attractive possibilities. Mountain City Copper proves that such exploration is at least sometimes successful. The hunt for such orebodies has only begun. It requires a large investment, and the ratio of success to failure may be small. A better knowledge of geology and of geophysical methods must precede extensive prospecting for deep hidden orebodies.

Examples of possible copper orebodies that may be found when economic needs and skill in ore finding are at a favorable level could be multiplied almost indefinitely. If the copper industry of the West dies, it will be because we have lost the talent and will for exploration, and not because the copper is not there.

Lead and Zinc

Lead and zinc present a more difficult problem. Reserves are so low and development is so far behind that for a few years at least, we must depend to a large degree on foreign production. Ores from marginal Western deposits cannot immediately replace the rapidly waning output from the great Tri-State District.

In the somewhat more distant future the prospect is brighter. The orebody that was largely responsible for the difficulty may point the way out. When flotation made it possible to produce several thousand tons per day of lead and zinc from the enormous Sullivan deposit of Consolidated Mining and Smelting Company at Kimberly, just north of the Idaho-British Columbia border, exploration for lead and zinc became an unattractive venture for 20 years. To be sure, Kimberly is north of the border, but it took away any great possible export market and even with the tariff the domestic price could not greatly increase in peace time. Now that the lead and zinc supply is so dangerously limited, we need another Sullivan Mine like that at Kimberly, but on our side of the border. Maybe it is there. The Sullivan orebodies are replacements on a gigantic scale of quartzite by almost solid lead, zinc and iron sulphides. Yet the largest body did not come to the surface at all, and only a small tip of the smaller one outcropped. Similar quartzites are known to occur over hundreds of square miles in Idaho and Washington. Drilling in the past few years has found several fair sized orebodies, and there are many smaller lead-zinc showings. Why should there not be other exceedingly great orebodies that do not outcrop? As the ore is predominantly sulphides, geophysical properties must be far different from those in the barren quartzite. There should be an excellent chance of discovering great lead-zinc lenses by a combination of geology with geophysics.

While the northwest seems to present the greatest possibility of finding ore that will replace the Tri-State District, many smaller lead-zinc orebodies, often with high silver values, should be found by an active exploration campaign. The almost fantastically rich Chester lead-silver vein is an example of the prizes that may reward deep exploration in the Coeur d'Alenes. The lead-zinc-silver districts of Colorado and Utah, though less spectacular, are far from exhausted. New bedded deposits will certainly be found in the Tri-State area, extending across the Mississippi into Kentucky. With prices for lead and zinc in proportion to costs, exploration should in a few years remove the United States from the list of "have not" nations as far as these metals are concerned.

Quicksilver

Among the industrial metals that are produced in smaller quantity, though no less essential, quicksilver shows most forcibly the effect of a metal price in keeping with increased costs. Up to the start of World War II, the price of quicksilver in this country averaged less than $90 per flask, and domestic production was from 6,000 to a maximum of 25,000 flasks per year. The ore from which the 1937 domestic production of 16,500 flasks was made averaged in the neighborhood of 7 pounds per ton. With increased demand at the outbreak of the war, the price skyrocketed to about $200 per flask, and remained at $190 until the end of 1943, when Government purchases ceased. As a result many small mines were reopened, and an active exploration campaign found many new orebodies, several of which were exceedingly rich. Domestic production reached 45,000 flasks in 1941. After the price had dropped to less than $100 per flask, in the last half of 1944, production was still far greater than in 1937 and the average grade of ore was about 13 pounds, or nearly double that in 1937. This was entirely due to rich orebodies found during the years of high prices. The advancing price due to spectacular new uses, particularly the dry cell battery, has already started a new search for mercury mines. As long as this continues, domestic mines should continue to supply at least a large part of the quicksilver needed in the United States.

Ferro-Alloy Metals

Comparatively high prices were also responsible for the development of large new deposits of tungsten and vanadium ores. As long as consumption does not greatly exceed that before the war, we should be largely independent of foreign supply of these ferro-alloy metals, at a price little above that in fairly prosperous prewar years. In molybdenum, the wonderful Climax orebody makes us the chief source of this metal for all the world. The new Urad orebody in southern Colorado shows that opportunities for development of molybdenum are still attractive. In antimony, too, the domestic supply has been increased many times over by the Stibnite orebody of Bradley Mining Company, and other antimony orebodies will doubtless be found.

The essential ferro-alloy metals, chrome and manganese, have not been found in the United States in great deposits of high grade ore like those in Russia, Turkey, and South Africa. However, there are many

(*Continued on page* 68)

TO COMPANY PRESIDENTS:----------

Here's Another BIG CHANCE FOR YOU to "Pass the Ammunition!"

Today—thanks largely to you and other industrial executives—22,000,000 civilian workers are speeding victory and achieving postwar security through the Payroll Savings Plan. Over 60% of the 6th War Loan subscriptions came from this source—and, between drives, this forward-looking plan has been responsible for 3 out of 4 War Bond sales!

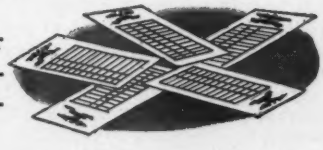
Good as this record is, the Payroll Savings Plan can be still more effective. Believing this can best be accomplished by giving Bond buyers a definite idea of the many benefits accruing to them, the War Finance Division has prepared a variety of active aids for employee education.

This new "ammunition" includes:

a—An entertaining, swift-paced moving picture, graphically showing the importance of buying—and holding—War Bonds.

b—An interesting, easy-to-read booklet, explaining how War Bonds may be accumulated to provide education for children, homes, retirement incomes, etc.

c—Attractive, handy War Bond envelopes, enabling Bond holders to note each separate purchase—and the specific purpose for which each Bond or group of Bonds was bought.



Passing this particular ammunition requires that you reappraise your own company's Payroll Savings Plan. Have your own War Bond Chairman contact the local War Finance Committee—today! They will welcome the chance to discuss this new program with you.

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council

In the ability to change from placer dredges to howitzers, multiplied many-fold, can be traced America's success on the home front in support of its fighting men

155mm HOWITZERS By Yuba*

Yuba's Benicia Plant, Long Busily Engaged in Dredge Building Has Turned to Munitions Making

By H. A. SAWIN
Sales Engineer
Yuba Manufacturing Company

TO keep abreast of normal change in current affairs tests the fibre of every manufacturer, and ability to meet industrial change is the measure of success in any business. Change brought about by war is often as violent as war itself. Whole industries, such as gold mining, are closed down by Government order; or as in countless cases the peace-time product is cast aside in favor of armament or supplies needed by fighting forces. It was just such change that Yuba Manufacturing Company found forced upon it in the months following Pearl Harbor. Its dredging customers were in the hands of the enemy or closed down by WPB Order L 208. It had, however, a nucleus of experienced executives and craftsmen which attracted attention of the War Department, particularly the San Francisco Ordnance District. Its experience with the manufacture of heavy machinery for placer dredging made it possible to change quickly to the production of 155 mm howitzers for the Army.

Preliminary discussion by a representative of Yuba with Army men in Washington led to the conviction that Yuba's plant and organization could be rapidly expanded and retooled for a howitzer program. In January, 1942, six Yuba men were sent to Watervliet Arsenal to make a study of the work to be done. Many substitutions in the original list of new tools were necessary. Many new employes were trained, among them men and women with no previous experience. Space does not permit a long account of the success with which Yuba met the changing times; but the swing from dredge machinery with relatively coarse and easy fitting parts, to ordnance requiring a working knowledge of "tenth of a thousandths" inches was accomplished on schedule and the first Yuba howitzer was delivered just a year and a day after receiving its contract from the Army.

Since only four of the component parts are made in Yuba's Benicia, Calif., plant, it requires the services of 20 subcontractors to make the 100-odd other pieces. Yuba's purchasing agent, E. Q. Parker, organized this important part of the program. W. B. Macaulay, chief engineer for Yuba, and his staff, designed new tools to

* Report approved by Army Ordnance.

accomplish some of the work which "couldn't be done." The new tools include a swing clearance shaper which cuts a radial surface and attachments for lathes to cut breech-ring and breech-lock threads. These are step-threads of three different radii and special form. The jump action of the cutting tool is controlled by an electronic device perfected by Yuba's electrical engineer. Since the start, experience and new methods have resulted in greater production and lower costs. The new tools perfected and invented at Yuba have been adopted for use in other plants and arsenals doing ordnance work.

Constant inspection and supervision during assembly keeps rejections to a minimum. The finished product must not fail. The relatively small number of rejections during manufacture speaks well for the skill acquired by the new employes at Yuba's and its subcontractors' plants. The inspector's approval is the real test of a person's place in the production line; age, sex or previous experience count little. Yuba's plant superintendent, George H. Westerberg, and general foreman, Dan Barrett, are old employes, both having come up the hard way from apprenticeship. Patience and care required to train new workers is the core of later ability and skill acquired. To a stranger, Yuba's plant looks like many other machine shops except for the long lathes and rifling machines, but experienced shop people know that the product is measured to close tolerances and represents skill of the highest type. The howitzer program from the start has been under the direction of Charles M. Romanowitz, well known dredge engineer and sales manager for Yuba, for many years. F. C. van Deinse, Yuba's President, in a recently published booklet for employes, complimented them for the sustained effort which brought them an Army-Navy "E" award with one star and just recently an "E" award to three subcontractors. In the ability to change from placer dredges to howitzers, multiplied a thousand-fold, can be traced America's' success on the home front in support of its fighting men.

Operation of this vertical mill, working on a breech block, is done by womanpower like so many other jobs around the plant

Assembly room for the 155 mm. howitzers. The first one was delivered just a year and a day after receiving the Army contract

High Voltage Distribution Systems for Mines

THIS IS A COAL DIVISION REPORT

By the COMMITTEE ON UNDERGROUND POWER

Recommendations for primary power circuits from the high voltage transformers to the surface or mine substations

THE prime requisites of a proper electric power supply system for mining operations are reliability and safety. Reliability implies day in and day out availability of electric power for instant utilization for lighting, ventilation, pumping, cutting, loading and hauling as well as the many surface operations. Safety means, primarily, safety to the operating personnel; secondly, safety to the mechanical apparatus—protection against abuse which results in service outage, loss of production and in maintenance expense.

A power supply system which will thus insure the safe and economical operation of a mine must be planned with care and with the best available technical skill. Proper protection for electrical installations in and around mines pays dividends in maintained production that are far in excess of the investment involved.

The following recommendations are intended to cover particularly distribution systems for primary power at voltages of the order of 2,400, 4,160 (or higher). The apparatus connected in such circuits should never be located in a gassy region of the mine. Therefore none of it described is considered to come within the category of permissible equipment. A subsequent report will deal with the distribution of secondary power at utilization voltages of 220 and 440, generally employed at and near the working face. It is appreciated that frequently motors for such drives as pumps, fans and hoists operate at primary voltages.

These recommendations include the circuits from the point at which power is purchased from the utility company (usually through a transformer bank); the surface distribution lines; and the primary power lines into the mine to the point where the low voltage distribution circuits begin.

A number of typical circuit and switching arrangements are included from which that most applicable to a specific case may be selected.

Surface Stations

Figure 1 illustrates the wiring arrangement of an outdoor transformer station, from the utility power lines to the 2,400 or 4,160 volt (or other high voltage) lines serving the mine feeders. Such feeders would enter the mine through the shaft or other entry whose opening was close by the transformer station. This example applies more particularly to large or especially important stations where the flexibility of a primary circuit breaker is desired. In Figure 1 the low voltage breaker generally would be required only for cases where the HV breaker might not be accessible for tripping by the mining company. (Its ownership might be lodged in the utility company, etc.)

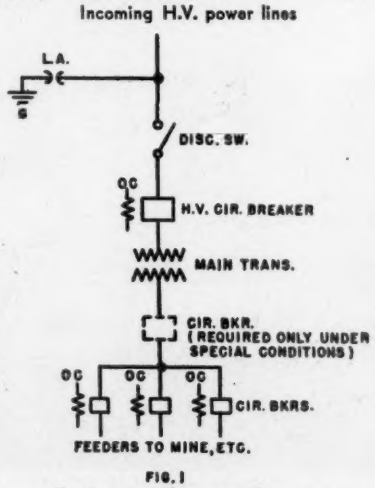


FIG. 1
Outdoor transformer station

The line disconnecting switches permit servicing the breaker and usually are single pole, hook operated, with no interlocking with the circuit breaker. In general, a transformer secondary breaker with induction type inverse-time over-current relays, is desirable to provide the following functions: (1) back-up protection of feeder breakers, and (2) provide a single switching member for a simple interlocking system with the primary switch. This is discussed more in detail in connection with Figure 2.

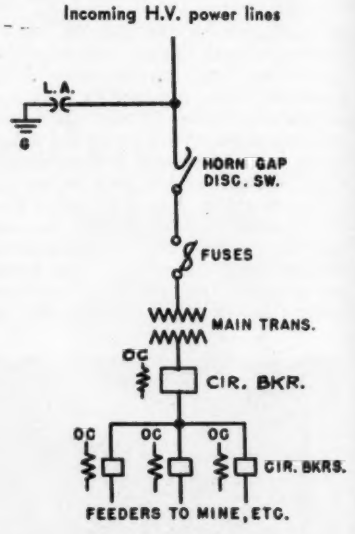


FIG. 2
Outdoor transformer station

Figure 2 shows a station similar to Figure 1, except with horn gap gang operated disconnecting switches and with primary fuses instead of a primary circuit breaker. This type of station would fulfill the requirements in many instances, especially for small and moderate capacity stations, and would be attractive because of its lower cost.

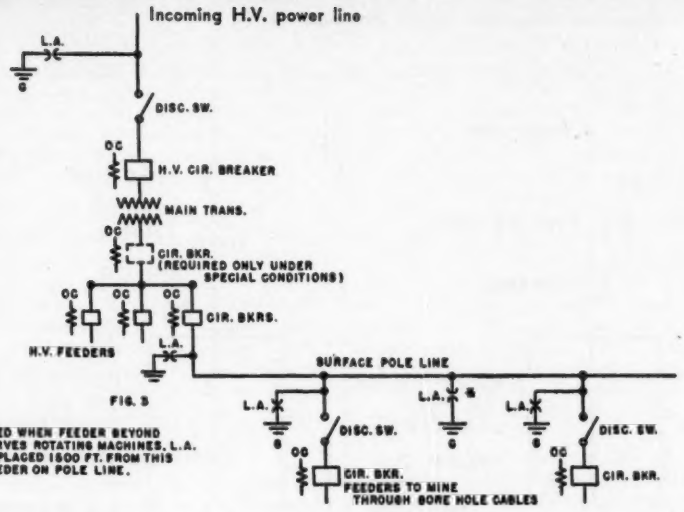


Fig. 3. Outdoor transformer station

The transformer secondary breaker is advisable for the two general reasons mentioned above. The deficiency of the primary fuses considered as back-up protection for the feeder breakers is in the moderate overcurrent region. In this region the fuses will not blow at all when selected large enough to coordinate properly at maximum secondary fault currents.

The horn gap switches should be key interlocked with the low voltage breakers to avoid interrupting the circuit under load. Such switches while capable of interrupting load current in an emergency, are rated to interrupt transformer magnetizing current only.

Figure 3 is similar to Figure 1 but is extended to show one mine feeder leaving the station on a surface pole line. This pole line generally follows the course of the mine and supplies several bore hole cables at tap-off points to take power underground.

While these stations are described as outdoor type, there are many instances, of course, where the equipment substantially as shown is actually installed in a building; or the secondary switching only may be indoors. These diagrams are intended to be functional only and do not indicate actual physical arrangements.

Substation Equipment

The main substation may be of the conventional open type, or of the metal-enclosed unit substation type. The latter offers advantages of greater compactness, safety, and economy of installation.

The word substation as used herein refers to a switching station or a combination transformer and switching station and not necessarily to a station containing conversion equipment.

The equipment of a typical station should include:

A set of single pole isolating disconnecting switches, stick operated, or gang operated horn gap switches.

An incoming line circuit breaker with induction type inverse time overcurrent relays, or hook operated current limiting fuses. (If a drawout type breaker is used the disconnecting switches are unnecessary. Such breakers generally are supplied with "unit substations.")

A three-phase, or three single-phase transformers.

A set of station type lightning arresters on primary. If a number of motors are on the secondary bus, a lightning arrester should be placed on the bus and capacitors installed at the terminals of each motor for protection against lightning and switching surges.

Transformers

The present-day trend is toward the use of three-phase units on account of their lower first cost, saving in installation cost and materials and lower space requirements. If service continuity is of extraordinary importance, however, and there is but one main source of power, and a delta-delta connection is satisfactory, it may be desirable to use three single-phase units so that the bank can be operated at 58 percent capacity with two transformers in open delta, should one unit become disabled.

Outdoor transformers should be liquid-filled and self-cooled, or forced-air-cooled.

Circuit Breakers and Fuses

An incoming line circuit breaker is preferable to fuses, because it provides greater switching flexibility, eliminates the need of fuse replacements, eliminates the possibility of single phasing, and povides better protection by making it possible to clear faults at lower current levels.

All breakers should have adequate interrupting and short-time current capacity (mechanical strength) to withstand the short circuit currents which the system is capable of developing. Usually recommendations for suitable breaker characteristics may be obtained from the utility company.

Large oil or air-circuit breakers of 100,000 kva interrupting capacity and above, should be electrically operated, while the smaller sizes may be either manually or electrically operated. For groups of three or four electrically operated breakers, d-c closing solenoids operated by copper oxide rectifiers, are indicated. Larger groups are more economically operated from a 125-volt storage battery.

All breakers should be equipped with *over-current* protection. Preferably this should be provided by means of induction type inverse-time overcurrent relays, which may be adjusted with the greatest accuracy and provide the highest degree of protection. Instantaneous type relays, or direct-acting a-c current trip coils may be suitable if carefully selected but provide limited protection as compared with the induction type and therefore are not recommended.

Where rectifier-solenoid operated breakers are used, breaker tripping is accomplished by means of 24 or 48 volt batteries, or by direct acting a-c trip coils. Where the installation includes a 125-volt battery, this is used for tripping as well as for closing.

Undervoltage relays generally are considered unnecessary and undesirable, but if used they should be of the *time delay* type to protect against interruptions due to momentary voltage dips. Undervoltage protection should be, and usually is, included in the various motor starting control equipment.

Other protective features, such as phase failure, phase reversal, or reverse-power relays, usually are considered unnecessary, but might be considered desirable in specific instances. When considered necessary, these features generally are provided in the separate motor control equipment.

Disconnecting switches, especially those of the horn gap type intended to interrupt transformer magnetizing current, are usually of the gang operated type. Plain isolating switches, as well as fused disconnects, com-

Incoming high voltage line from surface feeders (see Figs. 1, 2, 3)

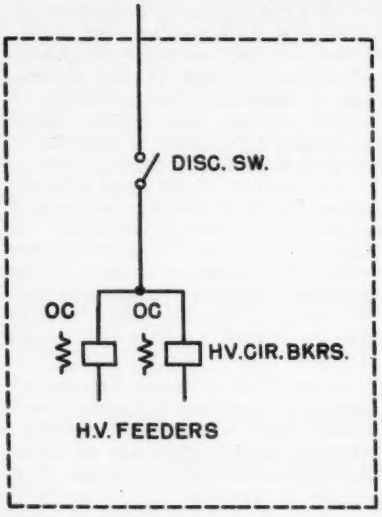


FIG. 4

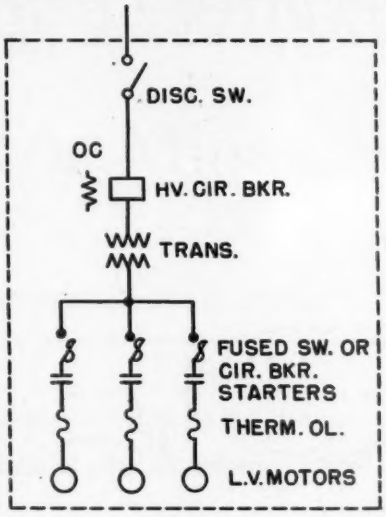


FIG. 5

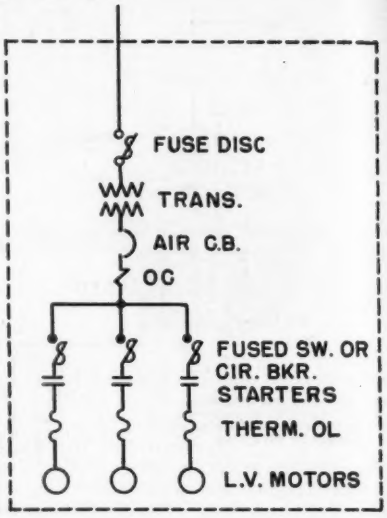


FIG. 6

NOTE: PRIMARY DISCONNECTING SWITCHES SHOULD BE INTERLOCKED WITH THE CIRCUIT BREAKERS WHICH FOLLOW THEM.

Incoming high voltage line from surface feeders (see Figs. 1, 2, 3)

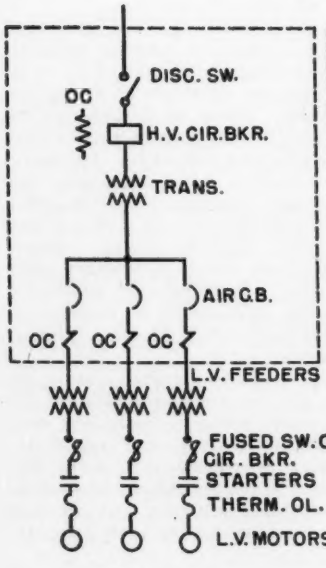


FIG. 7

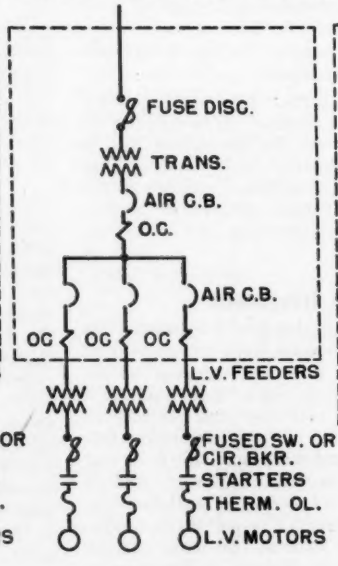


FIG. 8

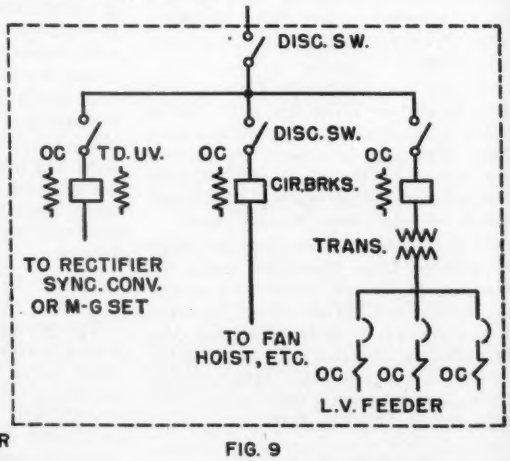


FIG. 9

NOTE: PRIMARY DISCONNECTING SWITCHES SHOULD BE INTERLOCKED WITH THE CIRCUIT BREAKERS WHICH FOLLOW THEM

TYPICAL CIRCUIT ARRANGEMENTS - UNDERGROUND LINES

monly are single pole and hook operated. Consideration should be given to interlocking disconnecting switches wherever possible, to prevent their being opened under load currents which they are not intended to interrupt.

Grounding

Careful attention should be given the matter of grounding of electrical circuits and equipment. In determining the practice to be adopted in any specific case it is recommended that reference be made to any existing state regulations and the advice of the utility company and electrical manufacturers solicited.

Underground Stations

In many respects the arrangement of protective features for the *primary power lines* underground is similar to those described in the foregoing for surface lines.

The high-voltage power may enter the mine through bore hole cables, or through cables in the hoisting shaft, air shaft, or other entrance.

The substation equipment at the "inside" terminals of the incoming lines will be similar to that described for the surface installation. Various types and arrangements of sub-stations at this point may be used, depending upon the circumstances; commonly used combinations are shown in the following diagrams:

Figure 4 shows the simplest form of a distribution arrangement for not more than two high-voltage feeders. In some cases isolating disconnects may be desirable ahead of each circuit breaker. Interlocking should be provided to prevent opening the disconnecting switches under load. Modern type switchgear with drawout type breakers automatically provides this interlocked disconnecting feature.

Figure 5 covers an underground transformer station supplying a number of low-voltage motors each equipped with a magnetic starter and a circuit breaker or fused switch. In this arrangement a primary circuit breaker and line disconnecting switches are used.

Figure 6 is similar to Figure 5 except fuses instead of a circuit breaker are used in the primary lines. In this case a secondary breaker is recommended for the same reasons discussed under Figure 3 for surface lines. The primary fuse disconnecting switch should be of the gang-operated type preferably mounted on the transformer.

Figure 7 shows a transformer station very similar to Figure 5 except with several low-voltage feeders leaving the substation to feed remote motor starters.

Figure 8 differs from Figure 7 only in that the primary circuit breaker has been replaced by primary fuses and a main secondary breaker added.

The "unit substation" construction is especially adaptable for the cases covered by Figures 5, 6, 7 and 8. A "unit substation" for inside-of-mine service usually consists of an Askarel (non-inflammable liquid) or dry-type transformer and switching equipment assembled as a unit.

Figure 9 is a typical combination substation, for conversion of a-c to d-c power, for transforming to low-voltage a-c and for high-voltage mine feeders. All of this equipment may be located at the bottom of the bore-hole or some of the switching equipment may be located at a remote point.

The above are merely a few of the available combinations used underground and many other arrangements and combinations are in use and can be used as long as the principal functions indicated are adhered to.

Means should be provided to disconnect all power circuits leading underground in case of an emergency without undue delay. To accomplish this, it may be desirable to arrange for tripping the circuit breakers by remote control. Where this arrangement is adopted, a voltmeter or indicating light should be located at the nearest underground branch or feeder to indicate where such circuits have been interrupted.

Transformers

The remarks in the foregoing for the surface-installed transformers apply generally to those underground. Underground transformers should be of the non-inflammable liquid (Askarel), or air-cooled (dry) type. These transformers must be installed in accordance with the safety regulations applying to such installations.

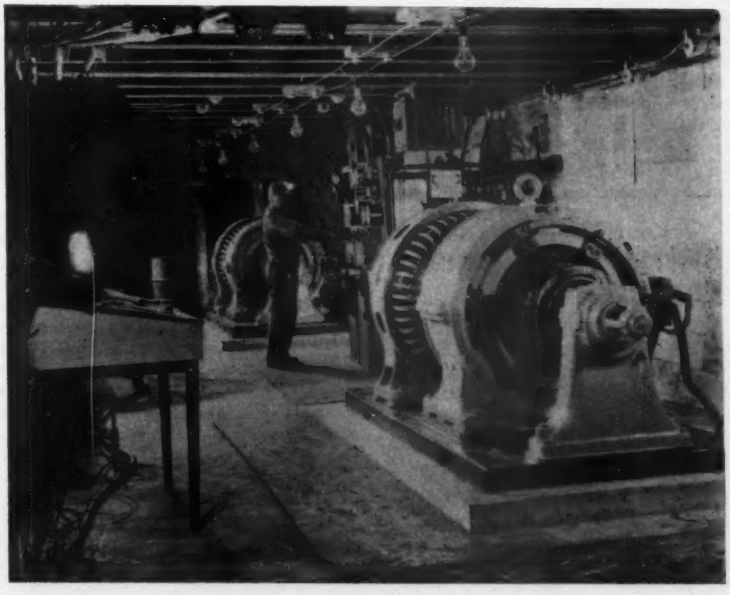
THIS IS A COAL DIVISION REPORT

Circuit Breakers, Fuses, Disconnects

The recommendations for circuit breakers and disconnecting switches for above-ground service generally apply also to underground installations. Air circuit breakers are especially recommended for underground service, as the hazard of inflammable oil is eliminated.

Lightning Arresters

It is recommended that due consideration be given to the use of lightning arresters underground, especially on the high-voltage circuit at the bottom of the bore hole cable or where this circuit enters the underground substation. Advice on this practice should be obtained from the utility power company or electrical manufacturers.



WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

STIRRING successes of American armies in Germany and the Pacific have marked the weeks following the President's report to Congress on the Allied conference in the Crimea.

White House approval of the George bill divorcing the lending agencies from the Department of Commerce was accompanied by immediate action on the part of the Senate in confirming the appointment of Henry Wallace as Secretary of Commerce. Likewise, Capitol Hill voiced the fullest approval of the appointment of Economic Stabilization Director Fred M. Vinson of Kentucky as head of the Federal lending agencies. A surprise move following Vinson's appointment was the selection of War Labor Board Chairman Davis as Vinson's successor to the Office of Economic Stabilization. Replacing Davis on the Board is the former Vice Chairman, Dr. George W. Taylor.

Apparently timed to precede the United Nations Conference at San Francisco April 25, are Administration measures to increase the national debt limit to $300,000,000,000, extend the lend-lease program, reduce from 40 percent to 25 percent the gold backing of the Federal currency, and secure approval of the Bretton Woods proposal authorizing U. S. participation in an International Monetary Stabilization Fund and World Bank for Reconstruction and Development.

Coal Mine Wages

Jumping the gun on the bituminous operator-miner joint wage-scale negotiations which began March 1, UMWA John Lewis, on February 26, called for a strike vote under the War Labor Disputes Act. Despite protests from the management side of the controversy that a labor dispute does not exist, the National Labor Relations Board is going ahead with the necessary procedure to take the vote, incidentally at a cost estimated at $300,000.

Meeting the operators' representatives gathered from all coal mining districts in the United States, Lewis presented 18 proposals including (1) an extension of the agreement cancellable on 20 days' notice by either party; (2) a 10-cent per ton "participating royalty" to the union for medical service, insurance, rehabilitation and "economic protection"; (3) free explosives and accessories; (4) inclusion in the union of all employes except the superintendent and one mine foreman; (5) elimination of all district pay differentials; (6) 10 cents per hour differential pay for second shift and 15 cents for third shift; (7) increase in vacation pay from $50 to $100; (8) protection of veterans in reemployment and seniority rights; (9) only union-made tools and explosives to be furnished; (10) improvement of housing conditions and establishment of wash houses; (11) computation of all time underground, including 15 minutes of lunch time, upon the seven-hour day, 35-hour week, with time and one-half the rate and one-half for all overtime in excess of seven hours per day and 35 hours per week; (12) mobile loader and conveyor operators' rates to apply to all men in the unit; (13) maintenance of earnings and rate relationships of outside day men including employes in strip mining; (14) safety equipment worn by mine workers furnished without charge; (15) amendment of existing agreements to permit joint settlement efforts before reference to higher tribunal; (16) amendment of "management clause" to permit appeal by mine workers transferred from day wage classifications to face or tonnage work; (17) reconsideration of provisions on impurities, holidays, physical examinations, fines, laying of track, electricians and mechanics; and (18) that it shall not be a violation of the wage agreement for mine workers to cease work to prevent shipment of coal to consumers whose employes are engaged in a legal strike.

The 10-cent per ton participating royalty demand has aroused editorial criticism throughout the country. At current rates of coal production, it would approximate $60,000,000 annually. It is castigated as a "Petrillo" demand wholly un-American and inimical to the future of all industries and all consumers. It is certain that the most determined resistance is forthcoming on this feature of the wage negotiations.

Personnel of the negotiating subcommittee is as follows: Operators—Charles O'Neill, North; Edward R. Burke, South; George F. Campbell, middle West; Kenneth A. Spencer, West; Harry M. Moses, captive; Hubert E. Howard, stripping, Illinois and Indiana; alternates—Harvy Cartwright, middle West and Eugene McAuliffe, West. UMWA—John L. Lewis; John O'Leary, vice president, UMWA; James Mark, Pennsylvania; George T. Titler, West Virginia; Hugh White, Illinois; Frank Hefferly, Colorado; alternates—William Mitch, Alabama and Sam Caddy, Kentucky.

Work or Fight

A greatly modified manpower bill has been passed by the Senate and sent back to the House for consider-

Washington Highlights

CONGRESS: Paving way for United Nations San Francisco Conference.

COAL MINERS: Spring "participating royalty" demand.

WORK OR FIGHT: Senate's greatly modified measure goes to conference.

SUPREME COURT: Hears argument on Jewell Ridge case.

GOLD: Federal Reserve seeks reduction in gold backing of currency.

BRETTON WOODS: Congressional hearings under way.

ACT OF CHAPULTEPEC: Western Hemisphere Nations expect tariff reductions.

PREMIUM PRICES: Hayden bill reported to Senate.

FOREMEN'S UNIONS: NLRB wavers on Maryland Dry Dock decision.

"FRINGE" AWARDS: WLB powers clarified.

ation with the more severe May bill discussed last month. In the Senate version, the War Manpower Commission is authorized to establish employment ceilings and men and women of all ages are under the Commission's control. Power to make in-plant manpower surveys is granted WMC and the Director of War Mobilization is authorized to examine the utilization of manpower by the Departments of War and Navy. Tightened is the control of farm workers, who are subjected to heavy penalties for quitting their jobs. Seniority rights in former employment are guaranteed to workmen who enter war industries and the Management-Labor Committees of WMC are granted statutory authority.

Lower Gold Reserves

At hearings before both Senate and House Banking and Currency Committees on the Wagner-Spence bill reducing the minimum gold backing behind Federal reserve notes and deposits to 25 percent, Board Chairman Marriner Eccles has made some extremely disconcerting statements. Since 1913 the Federal Reserve Act has called for a reserve of 40 percent in gold certificates against Federal Reserve notes in circulation and 35 percent in gold certificates or other lawful money against deposits. Also asked in the bill is the indefinite extension of the power of Federal Reserve Banks (otherwise expiring June 30) to pledge U. S. Government securities against Federal Reserve notes.

Testifying that the use of gold as backing for the currency is "a concession to orthodoxy," Eccles stated that no gold reserve is actually required and that the United States is "the only country left that still has the archaic idea of maintaining a gold reserve back of our currency." He continued that the volume of currency issued and in circulation, in relation to the supply of gold, simply does not mean anything any more and that "it is useless to spend time debating over a thing which really has ceased to exist."

The American Bankers Association's president, W. Randolph Burgess, appeared before the committee advocating that the reduction of the reserve be limited to 30 percent and contended strongly for careful scrutiny of proposals for post-war spending, urging that the Committee secure a comprehensive report from the Federal Reserve Board "on the danger of inflation and the proposed methods for its avoidance." Declaring himself to be a hard money man, Burgess asserted, "I think we hard-money men have our backs to the wall because the totalitarian governments all over the world are trying desperately to get away from gold. . . ."

Rep. Clair Engle (Dem., Calif.) gave the committee the views of the Western Congressional group in the House, the members of which, while favoring an increase in the price of gold to $56 (the Engle-McFarland bill), urged that any reduction in the gold backing of the Federal Reserve currency, be held to 30 percent for not over two years and automatically restored to 40 percent thereafter.

In a statement to both Senate and House Committees on the proposed reduction in the reserve requirements, Julian D. Conover, Secretary of the American Mining Congress, emphasized the importance of limiting the reduction to 30 percent and fixing a termination date for such legislation, so that the long-established 40 percent requirement might be restored as quickly as possible. He summed up by saying:

"Basically, we believe in a sound monetary system, with adequate metallic backing. Reduction of the gold reserve behind our money is a step toward a managed currency with all its evils, and away from sound and tested monetary principles. We should go no further in this direction, and for no longer a period, than absolutely necessary. We disagree strongly with the view of Mr. Eccles that a gold reserve is 'a concession to orthodoxy' and that the pending legislation is a 'technical matter,' on which the Treasury had been consulted but as to which 'nobody else would be familiar with it or would be interested in it.' We submit that this legislation is of the most far reaching consequence to the future economy and prosperity of our country, that the utmost caution should be observed, that if we go through a 'red light' set up by the Congress and scrupulously observed for 30 years, we should keep the brakes in sound working order. We should not, under the stress of emergency, take any action that might disturb confidence in the integrity of the American dollar, or jeopardize the protection to our currency afforded by an adequate gold backing."

Action on Bretton Woods

Speeding up under Administration desire for enactment of the Bretton Woods proposal for an International Monetary Stabilization Fund and International Bank, Chairman Brent Spence, of the House Committee on Banking and Currency, opened hearings on March 7 on the authorizing bill introduced by himself and Senator Wagner. Considering the proposal as an executive agreement, not a treaty, the bill authorized U. S. participation in the Fund and the Bank, repeals the Johnson Act which prohibits loans to countries in default on their debts to the U. S., and fixes the value of the dollar at the present level.

Sponsoring the bill before the Committee, Secretary Morgenthau urged action prior to the United Nations Conference in San Francisco April 25 and asserted that the operation of the Bank will offer American investors the best protection ever had in the field of foreign finance. Assistant Secretary of State Dean Acheson asserted that the Monetary Fund and the Bank are essential to each other and that under the proposal the member nations will define their currencies in terms of gold; hold their currencies to the fixed value within a margin of 1 percent; place no restrictions on payments for current trade transactions, and consult first with the Fund when the need is felt for a change in the fixed currency value.

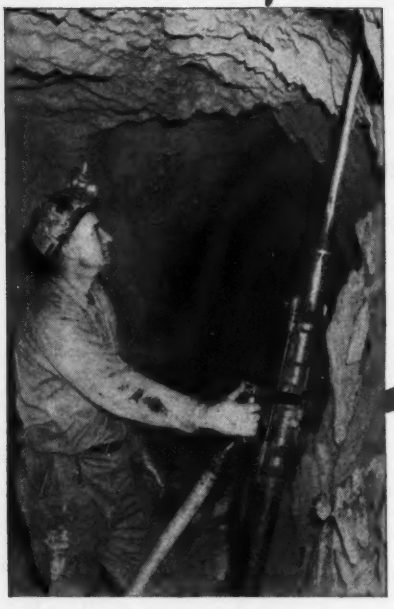
Conference of Chapultepec

In the "Act of Chapultepec" consummated by the Western Hemisphere nations at Mexico City early in March, delegates from the United States are reported as emphasizing the lifting of trade barriers, action against cartels, preservation of the right of private enterprise and the protection of foreign investments. William L. Clayton of Texas, now Assistant Secretary of State, in addressing the conference on the post-war phases of Western Hemisphere relations, is reported to have warned that while the United States is in earnest on the good-neighbor policy, this nation must first take care of its own problems, and that many policies advocated by U. S. Government executive departments must be subject to the ultimate action of the Congress. As means of aid he referred to the Export-Import Bank, the Bretton Woods Fund and Bank, the lowering of tariffs and the purchase of raw materials for security stockpile purposes. A further interesting statement attributed to Clayton is that "We expect that there will be legislation in the United States authorizing a post-war stockpile of strategic and critical materials to provide for military security and for our contribution to the maintenance of security in the Western Hemisphere and in the world."

Premium Metal Prices

Hearings were held March 5 on the bill, S. 502, introduced by Senators Hayden and McFarland of Arizona, and others and which, as discussed last month, would extend payments with respect to strategic and critical metals and minerals and petroleum and petroleum products to June 30, 1946. In reporting the measure, it was amended to include payments for rubber, meat, butter, flour, and other commodities up to a total authorization of $1,468,000,000, under which copper, lead and zinc are allotted

(*Continued on page* 68)



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Personals

R. R. Knill has resigned his position as safety engineer for the Union Pacific Coal Co., Rock Springs, Wyo. He has been with the company since 1924 in various capacities and has been safety engineer since 1937.

A. H. Bebee, general manager of Carlton properties at Cripple Creek, Colo., was recently named by Governor Vivian as a director of the Colorado Metal Mining Fund. He succeeds the late Norris E. Eads.

J. E. Busch, Phoenix, Ariz., field examiner for the General Land Office for over 20 years, has retired. Throughout his long service he has been one of the most highly regarded examiners of the Southwest.

James D. Ireland has become operating vice president of the Cameo Coal Mining Co., and the Lando Coal Corp., and is a member of the management committee with headquarters at Cameo, W. Va. He was formerly superintendent of the Crow Hollow Division of the Hanna Coal Co. The Cameo Coal Mining Company operates properties in Boone County and Mingo County, W. Va.

Ralph J. Cordiner has been elected vice president and assistant to the president of the General Electric Company with general administrative duties as designated by the president, as announced by Charles E. Wilson, president. Mr. Cordiner has been assistant to the president for the past 18 months, since his resignation as vice chairman of the War Production Board.

R. L. Loofbourow has left the Howe Sound Co.'s operations in Mexico to take up duties with the E. J. Longyear Co. He will be assigned to mine development work under the supervision of J. Murray Riddell.

The annual meeting of the Clayton Silver Mines Company, held in Wallace in January, resulted in the election of W. M. Yeamans, Yakima, Wash., president; Judge A. H. Featherstone, vice president; Ray Morrison, Wallace, secretary-treasurer; and C. A. Fay, manager of the mine at Clayton, Idaho.

William S. Speed, president of the Black Star Coal Corporation, which operates in Harlan County, Ky., was recently elected to the Board of Trustees of the University of Louisville.

Arthur S. Knoizen, who recently announced his resignation as director of the mining division of the War Production Board, has reconsidered and has consented to remain as director of this division.

Perry G. Harrison will continue as president of the Evergreen Mines Co., a substantial stock interest of which was recently acquired by the M. A. Hanna Co. Evergreen, under Mr. Harrison's management, has advanced from a one-mine Cuyuna Range producer, of under 50,000 tons of ore per year in 1928, to distributor of some 3,000,000 tons of ore a year from both the Cuyuna and Mesabi Ranges. Mr. Harrison will also assume the position of ore sales manager of the M. A. Hanna Co., with offices in Cleveland, Ohio, but will continue to reside at Crosby, Minn.

Perry G. Harrison

Present iron ore operating officials of the M. A. Hanna Co. in the Northwest are: E. E. Hunner, general manager, Duluth, Minn.; G. M. Cannon, assistant general manager, Iron River, Mich.; and R. C. Fish, general superintendent, Hibbing, Minn. Evergreen Mines Company properties will be under their active operating management.

Ewell J. Lytton has resigned as regional bituminous coal manager, Bluefield, W. Va., and has been elected treasurer of the Utilities Elkhorn Coal Company, Pikeville, Ky.

R. L. Wahl, general superintendent for the Inland Steel Company, was recently presented with a fine engraved wrist watch at a mining superintendents' meeting at Ishpeming, Mich. Presentation was made to commemorate his 30 years' service with the company. Clarence C. Randolph, vice president of the Inland Steel Company, made the presentation.

Lawrence A. Roe, mining technologist, has joined the staff of Battelle Institute, Columbus, Ohio, where he will be engaged in research in ore dressing and materials beneficiation. Roe attended the Wisconsin Institute of Technology and the Missouri School of Mines and for the past five years has been with the American Potash and Chemical Corporation, Trona, Calif., as a supervisor and research engineer.

W. E. Sellards, of Huntington, W. Va., who is president of the Left Fork Fuel Company, was recently appointed general manager of the Margarette Coal Corp. This corporation operates a mine at Marfrance in Greenbrier County. It is reported that Left Fork Fuel Company will open a new mechanized mine on leased land near the Margarette property.

Max Tessmer, who has been in charge of shaft sinking and underground mining operations in the limestone mines of the Pittsburgh Plate Glass Company in Barberton, Ohio, has become mining engineer at Gouverneur, N. Y., for International Talc Co., Inc.

Governor John J. Dempsey, of New Mexico, has not yet appointed a new state geologist to succeed John H. Kelly, resigned. The state geologist also serves as the director of the State Bureau of Mines and Mineral Resources at the State School of Mines at Socorro.

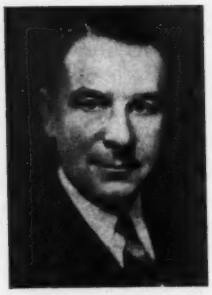
John V. S. Norton resigned December 30 from his position on WPB's Mining Division where he has been in charge of mining equipment for coal stripping operations. He will continue in a consulting capacity with this division, however.

Professor William A. Staub, of West Virginia University, has been appointed engineer representative of the Calcium Chloride Association. He will have charge of technical service with particular regard to the coal treating fields including such important items as dust proofing, freeze proofing, reduction of fire hazards, windage losses due to exceedingly dry fuel, etc. This unifies the activities formerly conducted separately by the four member companies.

Frank A. Wardlaw, Jr., manager, International Smelting and Refining Company, has been elected president of the Utah Metal Mine Operators' Association. He succeeds **D. D. Moffat**, president and general manager of Utah Copper Company.

E. H. Snyder, vice president and general manager of Combined Metals Reduction Company, was advanced to first vice president; **James W. Wade**, president and general manager of the Tintic Standard Mining Company, advanced to second vice president; and **O. N. Friendly**, vice president of the Park, Utah, Consolidated Mines Company, was elected third vice president. **A. G. Mackenzie** was reelected manager.

In contemplating expansion of its export activities, the Gardner-Denver Company, has reorganized its export division. **G. V. Leece**, Gardner-Denver vice president, who for the last five years has concentrated on export business, will manage the new export office which is located in New York. This arrangement will enable the company to cooperate to the best advantage with all its export customers.



The appointment of **Joseph A. Corgan** as chief of the Anthracite and Coke Section of the Economics and Statistics Service, Bureau of Mines, was announced recently by Dr. R. R. Sayers, Director of the Bureau. He is an authority on the economics of coal, coke and other fuels and has been with the Bureau of Mines since 1940. He has served as acting chief of the section for the past six months.

Alton Parker Hall has been appointed general manager of sales of American Chain & Cable Company, Inc., with headquarters at 230 Park Avenue, New York. Mr. Hall joined the company about a year ago as assistant general manager of sales after having been with Bethlehem Steel Company for 22 years.

A. H. Crane, vice president, West Virginia Coal & Coke Corporation, has announced that **Frank C. Baker** has retired from active service as the company's general land and tax agent and has been succeeded by **John W. Rine**. Both men reside at Elkins.

W. R. Van Slyke, of Eveleth, Minn., superintendent for a number of fee owners of mineral properties on the Mesabi Range, has been elected to the Board of Directors of Steep Rock Iron Mines, Ltd.

Robert G. Pfahler of Winber was recently reelected vice president of the Pennsylvania Society of Professional Engineers. **Samuel Baker** of Scranton was named president. Mr. Pfahler was appointed during the year to fill a vacancy and was representative of the Johnstown chapter at the annual meeting at Harrisburg.

Speakers at the Harrisburg meeting were: **Floyd Chalfant**, State Secretary of Commerce; **Edward Larson**, national secretary of the organization, and **J. S. Jennings**, past president of the Ohio branch of the society.

Harvey J. Gunderson has recently been appointed executive vice president and general counsel of Metals Reserve Company, succeeding **H. DeWitt Smith**. Major Gunderson was appointed assistant general counsel January, 1941, and general counsel in December, 1942. Until recently, he has been on active duty as chief of the stockpile shipping division, metals branch, production division, headquarters ASF.

Roy H. Glover, head of the Anaconda Copper Mining Company's legal department at Butte for the past two years, has been named Western general counsel for the company. He will continue to maintain his headquarters at Butte.

— *Obituaries* —

Charles W. Henderson, 59, supervising engineer of the field offices, mineral production and economics division of the U. S. Bureau of Mines, died January 26 at Mayo Brothers Clinic, Rochester, Minn. Mr. Henderson was in charge of the Denver office of the U. S. Geological Survey until 1925 and for 10 years following was in charge of the Denver office of the economics branch of the U. S. Bureau of Mines. He was adviser on numerous Government boards and author of numerous articles and reports. He recently prepared the history of mining in Colorado.

Joseph R. Walker, 81, first president of the Walker Mining Company in California, died December 21 at Salt Lake City, Utah. He was interested in a number of mining concerns including the Shower Standard, Tooele Kelsey, and Tintic Ophir in Utah, and Consolidated Gold and Metals Company and Walker Mining Company in California.

Raymond J. Moore, formerly chief engineer at the Hibbing office of the state departments of lands and minerals for the state of Minnesota, died at Duluth on January 9. He was supervising engineer representing the RFC at the Steep Rock iron mine development in Canada at the time of his death.

George L. Bemis, Sr., 90, credited with the discovery of Walker Mines in California, died December 24 at Salt Lake City, Utah. He had been active in Western mining since he was a boy of 15. Besides an interest in the Walker Mining Company, he was instrumental in organizing the Genessee Consolidated Mines Company.

Willard Bayliss, 71, retired mining superintendent for the Oliver Iron Mining Company of Hibbing, Minn., died January 5. He was long active in mining affairs of the Mesaba iron range.

William J. Montgomery, 71, died February 4 at his home in Columbus, Ohio. For 28 years he had been in active charge of the development and sale of mine fans for the Jeffrey Manufacturing Company; and though relatively inactive since 1935, had maintained contact with the company as consulting engineer on problems of mine ventilation. An authority on the latter, he published in 1936 a book "Theory and Practice of Mine Ventilation," which is a widely read textbook on that subject.

Stephan C. Kreyns, 45, formerly metallurgist for the American Smelting and Refining Company at Hayden, Ariz., and El Paso, Tex., died Feb. 7 in Perth Amboy, N. J., where he has been a research metallurgist for the company for some years.

Dale Higgins, representative for the Marion Steam Shovel Company in the Pittsburgh, Kans., territory, died recently of a heart attack.

Lyle H. Dayhoff, of Chicago, prominent mining company executive and well known to the industry, died in Florida on February 18 from a heart attack. His age was 59. He was chairman of the board of Republic Coal and Coke Co., and had been president of Little Betty Mining Corp., and Mariah Hill Super Block Coal Company.

SLASH TIMBERING COSTS

with Simplex Mine Roof Jacks

Cost-conscious mine operators have proved that Simplex Mine Roof Jacks cut costs per ton. They have found that:

✔ They are quickly installed and easily removed—no wedge blocks to hammer.

✔ They will not weaken in use—are stronger and safer than wood posts.

✔ They take less space—provide more clearance—are more visible, due to aluminum finish.

✔ They are lighter—easier to handle.

✔ They cannot loosen under pressure—easy to use—choice of lever nut or slide and drop operating handle.

The *new* M9 Mine Roof Jack. Screw and base can be used with pipe of any length.

New M9 and M17 Models Offer Added Advantages!

The new M9 and M17 Round Pipe Mine Roof Jacks offer further savings and increased usefulness. All you buy is the screw assembly and base. These are easily fastened to a piece of 2" pipe of the desired length and you have a jack made to order for the job at hand. In mines with seams of varying heights the use of these jacks does away with the necessity for a large inventory of timbering material. They cost less because all that you buy is the base and screw assembly. By furnishing your own pipe for the center column, you do not pay for extra material or added shipping weight.

Simplex Model M9, 8-tons capacity, has a 1½" screw for use with standard 2" pipe.

Simplex Model M17, 16-tons capacity, has a 1⅞" screw and is made for use with heavy duty 2" pipe.

TEMPLETON, KENLY & CO.,
CHICAGO (44), ILLINOIS

Better, Safer Jacks Since 1899
Simplex
LEVER SCREW HYDRAULIC
Jacks

New Sources of Ore

(*Continued from page* 54)

million tons of leaner material, from which production cannot compete with foreign sources in normal times. The problem of recovery of metals from leaner, more refractory domestic ores has been solved by large scale operations during the war. A further improvement in technology may make chrome and manganese mining in the United States a profitable industry. This would add greatly to employment and prosperity in Montana, Nevada, California, Arizona, and other states.

Gold and Silver

There has been no suggestion that United States gold and silver mines should be shut down permanently while these metals are obtained from abroad. Precious metal discoveries in the United States have been small compared with those in South Africa and Canada. However, the rich Sunshine and Chester silver veins in the Coeur d'Alenes, and the Getchell gold deposit, the newer homestake orebody, and many lesser discoveries in the past few years make it reasonable to expect that gold and silver mining can make a continued important contribution to the prosperity of the country and of the West for many decades to come.

Of all the metals on which the economy of the United States will depend in future years, it seems likely that only tin and nickel cannot be supplied to at least a major extent from domestic sources. There is a chance that improved technology may even make the lean nickel silicate deposits of Oregon a major source of this metal. With 80 percent of the world's supply of nickel ore just north of the Great Lakes, near Sudbury, there is no need to worry greatly over the nickel supply. Tin is in a more difficult position, as it must be brought many thousand miles by sea from Bolivia or the Orient. The answer to a possible tin shortage lies in stockpiling and in substitutes, particularly silver and plastics.

With these insignificant exceptions, the future of ore development in the United States seems as bright as ever before. Nature will continue to make us the most favored nation, if we have intelligence enough to make the best use of her favors. The ore is there, and the spirit of adventure that made the country great will find the ore as long as the rules of the game—taxation and Government control—let the best man win.

Wheels of Government

(*Continued from page* 63)

$88,000,000 while other strategic metals and minerals purchases are authorized to the extent of $48,000,000.

As reported to the Senate, the measure contains this proviso: "The premium price plan for copper, lead and zinc shall be extended to June 30, 1946, on the same terms as heretofore, except that all classes of premiums shall be non-cancellable unless necessary in order to make individual adjustments of income of specific mines."

In its report on the bill, the Committee stated that, "As mining is dependent upon development work and development work will only be done if there is a specific guaranty of reasonable prices for definite times, permitting the rules of the premium price plan in this respect to be changeable or subject to cancellation at the will of the executive agencies would make it impossible for the mining industry and particularly the small mines to plan ahead on a definits basis. . . ."

"The provision for making adjustments of individual premiums while prohibiting cancelation 'across the board' is to preserve the present method of adjusting quotas upward and downward to return the producer a reasonable profit plus amortization and other allowances, and at the same time to prevent excessive windfalls due to development of richer ore bodies. In making such adjustments in specific cases, it may be necessary to cancel an individual C, B, or special additional copper premium, or later, if costs rise or grade of ore drops, to restore such premiums in whole or in part, but it is not intended that initial A quotas shall be raised. The committee did not wish to prevent necessary flexibility but did want to prohibit using cancelation as a mechanism for forcing mines to shut down. Neither is it intended to interfere with the right to add new classes of premiums if the agencies feel that this will benefit or increase the production of copper, lead, and zinc."

Supervisory Employes

At further hearings conducted on February 27 by the National Labor Relations Board on the question of bargaining rights and union recognition for supervisory employes, the line of questioning followed by Chairman Millis and board member Houston gave indication of the possibility that the Board may reverse its governing Maryland Dry Dock decision, made in 1943, under which employers are not required to carry on collective bargaining with supervisory employes' organizations.

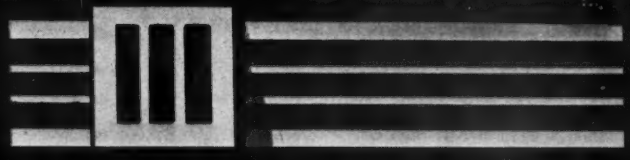
Supplementing its previous appearance at the Board hearing in February, 1944, the American Mining Congress presented a statement reaffirming its position in support of the Maryland Dry Dock case, and asserting that mining supervisory officials *are management* and that the full responsibility for the safe and efficient operation of our mines rests squarely on the shoulders of these men. It was further asserted that titles, practices and customs in mine supervision may vary according to locality or type of operations, but the demarcation between supervisors and workers is definite and fundamental. Again, it was stated that to assume that a three-point relationship of management-supervision-labor can supersede the current management-labor relationships successfully in bringing the benefits of industry to the American people, is a bid to destroy sound and experience-tested industrial relations.

The statement closed with the following words: "We believe that the right of rank-and-file workers to organize of their own volition is paralleled by the right on the part of management to establish industrial policy and to direct and supervise operations. In the interest of continued safety and efficiency in industrial production, we respectfully urge that the status quo between management and labor in this respect be strictly maintained. The Board's decision in the Maryland Dry Dock case constitutes sound doctrine and the mining industry looks to you to reaffirm this decision as a means of assuring protection to both management and labor in meeting war demands and in the return to peace-time production."

"Fringe" Awards

Coincident with his departure from the Office of Economic Stabilization to his new place as the head of the Federal Lending Agencies, Fred M. Vinson granted authority to the War Labor Board to make awards with reference to vacations, shift differentials, merit increases and reclassifications. Vinson's directive, however, carried the qualification that "if there is any reason to believe that such adjustments will cause an increase in price ceilings or production costs, they shall become effective only if approved by the Director of Economic Stabilization." This action, in part at least, clarifies the difficult situation of long standing since the so-called "fringe" awards first came into wide public notice in the course of the steel wage controversy. Vinson's successor, the former War Labor Board Chairman William H. Davis, is expected to take further steps, insofar as is possible, to bring about a better understanding of the range and authority of WLB in the difficult zone of "fringe" demands.

The Industrial Plants of this Nation Consume 145,000,000 Tons of Coal *Annually*

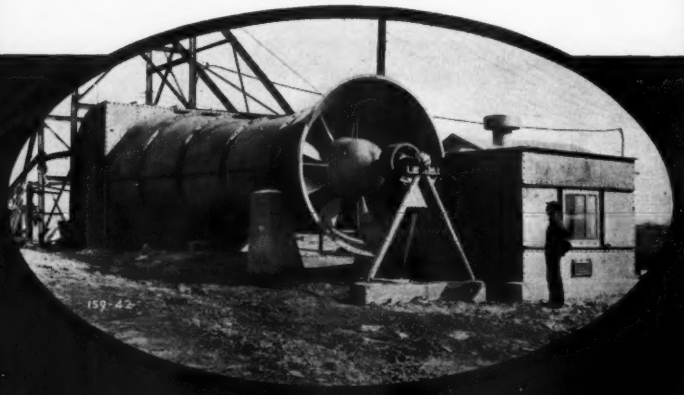


Jeffrey Drills, Cutters, Loaders, Mine Conveyors, Locomotives, Fans and a host of allied equipment and Replacement Parts aid the operator in maintaining an adequate supply of coal to keep the wheels of industry turning.

JEFFREY AERODYNE FANS

The Jeffrey Aerodyne Fan is especially designed to reduce ventilation costs. It is available in single or double stage units for operation against mine pressures up to 8" and 16" water gauge respectively. Installation cost is below that of average reversible centrifugal mine fans of equal capacity and the design permits reversal of the mine air by merely reversing direction of rotation of the motor. May be furnished with either fixed or adjustable rotor blades.

Illustrated at the right is a typical Jeffrey Aerodyne Fan installation at a large Utah coal mine. A close-up of a similar fan in another installation is shown below.



Jeffrey VENTILATION

JEFFREY SERVICE TO THE COAL MINES MEANS SERVICE TO ALL INDUSTRY

JEFFREY EQUIPMENT FOR COAL MINES

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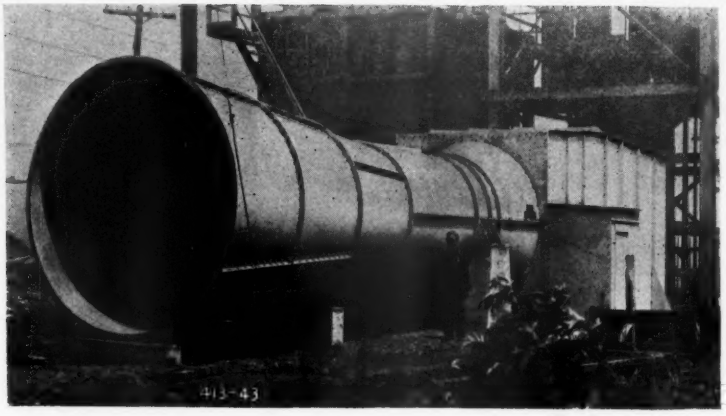
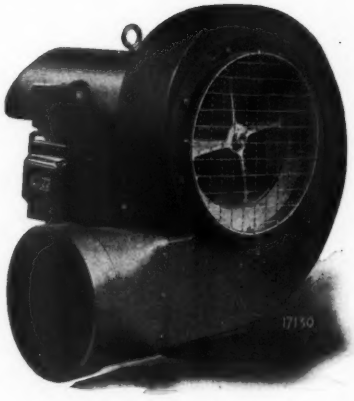
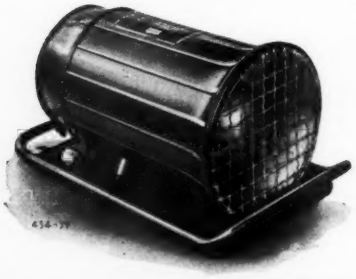
- CONVEYORS
- CRUSHERS
- CUTTERS
- DRILLS
- FANS
- JIGS
- LOADERS
- LOCOMOTIVES
- SCREENS



Jeffrey 8 H—84 Aerodyne Mine Fan equipped with air lock and adapter.



Jeffrey Universal Blower with adjustable angle of discharge — applicable for blowing or exhausting.



Jeffrey Aerodyne Midget Tubing Blower. Propeller type and flameproof.

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NEWS and VIEWS

—*The Washington Evening Star*

Eastern States

Wage Negotiating Committee

At a recent meeting of the anthracite operators, the following men were selected for the wage negotiating advisory committee: Major W. W. Inglis, Glen Alden Coal Company, chairman; Mr. Robert L. Birtley, Hammond Coal Company; Mr. H. J. Connolly, Pennsylvania Coal Company; Mr. James Prendergast, Susquehanna Collieries Company; Mr. J. B. Warriner, Lehigh Navigation Coal Company; Mr. C. A. Garner, Jeddo-Highland Company; Mr. Ralph E. Taggart, Philadelphia and Reading Coal and Iron Company; Mr. James H. Pierce, Edison Anthracite Coal Company; Mr. Santo Volpe, Volpe Coal Company; Mr. Louis J. Pagnotti, Pagnotti Coal Interests, Inc.; Mr. L. R. Close, Lehigh Valley Coal Company; Mr. F. W. Leamy, Hudson Coal Company; and Mr. George H. Jones, Stevens Coal Company.

From the foregoing advisory committee these seven men were selected for the negotiating committee: Major W. W. Inglis, chairman; Mr. R. L. Birtley, Mr. H. J. Connolly, Mr. James Prendergast, Mr. J. B. Warriner, Mr. C. A. Garner, and Mr. Ralph E. Taggart.

Potter Receives Award

Deputy Solid Fuels Administrator for War Charles J. Potter recently received a scroll in recognition of his "extraordinary contribution" in handling the nation's wartime fuel problems. Presentation was made at a luncheon in Washington by Dr. Walter Dill Scott, Evanston, Ill., chairman of the Solid Fuels Advisory War Council and president emeritus of Northwestern University. The presentation was made in behalf of the advisory council, whose membership comprises a cross-section of the coal industry and the public

New Breakers

The Northwest Coal Company, Carbondale, Pa., is gradually completing its new breaker on the Ontario and Western R. R., at what was formerly the Raymond Colliery of the Scranton Coal Company. This plant is built of wood, and is equipped with a Chance cone to clean the coal which will be shipped from Carbondale. Work is being done also on reopening the Raymond mine.

An addition of two steel pockets to the Olyphant breaker of the Hudson Coal Company will facilitate the loading of coal from that plant. Ultimately more coal cleaning equipment will be installed to clean the smaller sizes of coal.

Pennsylvania Coal Company Conference Plan

Mr. H. J. Connolly, president, Pennsylvania Coal Company, Scranton, has started a Pennsylvania Coal Company Conference Plan which has as its objective the bringing into closer contact of the managerial forces of the company. At certain intervals, the managers, superintendents and their assistants, foremen and their assistants, will meet for the purpose of considering the existing mining prob-

lems, and also the post-war situation. Both Mr. Connolly and General Manager R. A. Lambert anticipate that many helpful ideas will come from the meetings.

Importation of Miners

Regional, state and anthracite area officials of the War Manpower Commission are expected soon to discuss the acute mine labor shortage. Consideration will be given to the importation of men from liberated countries to work in anthracite coal mines. Mr. P. J. Connolly, director of the Scranton-Wilkes-Barre area, and his aides will be active participants in the discussions.

Coal Conservation Committee

Pennsylvania State Secretary of Mines Richard Maize was named director of coal conservation by Governor Edward Martin. The appointment was requested by Abe Fortas, acting Secretary of the Interior, Washington. The objectives of the committee comprehend "the stimulation of coal production and the conservation of its use when necessary."

New York Central's New Coal-Fired Locomotive

Many railroads are now giving much attention to improvements in steam locomotives burning coal. An example of the improved locomotive is the New York Central's new Class S-1 locomotive. It differs from other experimental new steam locomotives, because it still retains the steam cylininders and connecting rods of the conventional locomotive.

In line with the above, the following announcement is of interest: More than a million dollars have been subscribed by three major bituminous coal producing companies and six railroads to finance a research project to improve coal burning locomotives, and thus meet the Diesel locomotive challenge. The project will be handled by Bituminous Coal Research, and sponsored by the Island Creek Coal Company, M. A. Hanna Company, Sinclair Coal Company, Baltimore and Ohio R. R., Pennsylvania R. R., Louisville & Nashville R. R., Norfolk and Western R. R., New York Central R. R., and the Chesapeake and Ohio R. R.

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Resolution

WHEREAS, the production of the Pocahontas Coal Field has been curtailed about 150,000 tons weekly, perhaps equally because of the loss of manpower principally to the draft, and by the absenteeism of remaining workers earning extraordinarily high wages; and

WHEREAS, coal operators and miners generally have responded to the previous draft calls almost without protest, as has been admitted by officials of the Selective Service System, resulting in an unusually large loss of manpower for the coal industry and the Pocahontas District particularly. Beginning in 1941 with about 33,661 men producing 750,000 tons of high quality coal weekly, today less than 23,500 men produce about 600,000, a loss of 150,000 tons weekly; and

WHEREAS, previous draft calls have taken so liberally of the men between the ages of 18 and 38, that the average age has advanced from 35 to 46 years, materially reducing the efficiency of the human element, which has been supplemented by the utmost and perhaps ultimate use of mechanical mining; and

WHEREAS, the pending draft call threatens to take 70% of the relatively few remaining men under 30, practically all of whom will be irreplaceable key men vital to the maintenance of mining organizations:

THEREFORE BE IT RESOLVED, that our Legislative Representatives and officials of the governmental departments and bureaus be hereby cautioned that any further considerable reduction of working forces means necessarily depriving the war effort of the coal most necessary for metallurgical and other war production purposes.

POCAHONTAS OPERATORS ASSOCIATION.

W. E. E. Koepler, Secretary

John J. Lincoln, Pesident
O. L. Alexander, Vice President
Henry F. Warden, Treasurer
H. C. Faust
R. C. Luther
R. E. Salvati

Executive Committee

Bluefield, W. Va.
February 26, 1945.

Colcord Coal Company Dissolved

The Colcord Coal Company has been dissolved as of December 31, 1944, and its business assets transferred to the American Rolling Mill Company, of which it was a wholly owned subsidiary. No changes in operating personnel are anticipated with the property being operated as part of the mining division of Armco. Charles W. Connor, who was formerly vice president of Colcord Coal Company, is manager of the mining division of Armco, and C. E. Hough is general superintendent. Headquarters of the mining division are at Montcoal, W. Va.

The Armco mining division reports a very successful safety record for 1944 with a 78 percent improvement in severity over 1943 and a 55 percent improvement in frequency. This has occurred despite a 14 percent increase in power work. Mines operated by Armco in West Virginia and included in the above figures are the Nellis, at Nellis, and the Stickney, Dorothy and Henshaw, at Montcoal.

Amigo Coal Company Sold

According to a report, the Minter interests of Beckley, W. Va., have bought the Amigo Coal Company at Amigo in the Winding Gulf district. The mine is in the Pocahontas No. 3 coal seam, well known for its production of by-product coal. It is stated that subsequent to April 1, The Minter Fuel Company (E. C. Minter, president, and George W. Bright, sales manager) will handle the coal from this property. This organization has had a long and successful experience in the coal business; Mr. Minter organized his fuel company in 1920. The Minter Fuel Company is also sales agent for the Amigo Coal Company, Lanark Coals, Inc., the E. C. Minter Coal Company and the Shockley Creek Coal Co. These operations

produced approximately 600,000,000 tons of the nation's coal in 1944.

Koppers Personnel in War Service

A total of 2,810 men and women from the Koppers Coal Division, Eastern Gas and Fuel Associates and Koppers Stores have joined the armed forces in World War II, it is announced by L. C. Campbell, vice president of Eastern Gas. They are serving in all branches of the Army, Navy, Marine and Nursing Corps. Eighty-nine of the number have been killed, wounded, are missing in action or are prisoners of war.

The coal division has 2,505 on its war rolls and 305 have gone from Koppers Stores.

Award to Metals and Minerals Division

AN "Award of Achievement" has been conferred upon three WPB operating groups by the Army Ordnance Department, according to announcement by WPB Chairman Krug. The awards, made "in recognition of distinguished services and signal cooperation in connection with the accomplishments of the ordnance manufacturing and procurement program," were given to the Metals and Minerals Division as a group, the Chemicals Bureau and the Tools Division. Presentation of the awards was made by Major General Levin H. Campbell, Jr., Chief of Ordnance, to Philip D. Wilson, vice chairman for Metals and Minerals of WPB; Dr. D. P. Morgan, director of the Chemicals Bureau, and John S. Chafee, director of the Tools Division.

Approve Increased Blasting Charge

IN the Federal Register, February 6, 1945, page 1481, we note:

"Sec. 15.9. Conditions under which approval of explosives (including sheathed explosives) and blasting devices is granted.

"(a) Rescission of approval. The Bureau reserves the right to rescind for cause, at any time, any approval granted under this part. An explosive, sheathed explosive, or blasting device that has passed all tests necessary to place it on any of the Bureau's permissible lists may therefore be omitted from future lists.

"(b) Permissibility in use of an explosive. A coal mining explosive (sheathed or not sheathed) is permissible in use only when it satisfies the following requirements.

"Of special interest is No. 5 of these regulations:

"(5) That the quantity used for a shot (1) does not exceed 680 grams (1½ pounds) when fired in accordance with these requirements and (2) when used under certain additional requirements or restrictions does not exceed 1,361 grams (3 pounds). Note: The use of charges over 1½ pounds and not exceeding 3 pounds is approved tentatively pending further investigation. The approval, which may be withdrawn at any time, expires June 30, 1946, unless renewed. For charges over 1½ pounds, the following additional requirements must be observed:

"(1) Shot holes must be 6 ft. or greater in length.

"(2) Explosive must be charged in a continuous train with no cartridges

Victory Ships Launched

Sponsor of the "Pittston," first of three christened by girls from the hard coal areas as the reward for winning essay contests conducted by the SFAW, was Theresa Grodski, age 13, of Wilkes-Barre, Pa. Above: left to right, M. J. Kosik, Scranton, pres., Dist. 1, UMWA; U. S. Rep. D. Flood, Wilkes-Barre; Mayor J. J. Reilly, Pittston; Mrs. Grodski, W. J. Dougherty, Washington, Chief, Prod. Unit, SFAW; Kenneth Edwards, 16, Wanamie, sponsor's escort and contest winner; Miss Grodski, J. M. Willis, vice pres., Bethlehem-Fairfield Shipbuilding Corp.

THE Solid Fuels Administration reports that in recognition of the war-time production of hard coal miners, three victory ships launched at Baltimore on February 10, 21, and 22, were named for anthracite mining towns. Three school girls from coal miners' families christened the ships Pittston, Coaldale, and Mahoney City, these names having been selected by the U. S. Maritime Commission from a list of five names submitted by each girl. Three school boys were escorts for the girls, and the expenses of the group, including chaperons, were defrayed by local mine unions.

The three girls are the winners in an essay contest conducted last fall by SFA throughout all schools in the anthracite area on the subject "Why Maximum Production of Anthracite Is Essential to the War Effort and to Post-War Future of the Industry." Deputy Solid Fuels Administrator Potter has stated that the general interest aroused by the essay contest and the christening has helped to emphasize the role of hard coal miners and their families in the war effort, and he hopes that some similar action in the bituminous areas may follow.

deliberately deformed or crushed, with all cartridges in contact with each other, and with the end cartridges touching the rear of the hole and the stemming, respectively.

"(3) Examinations for gas must be made in the blasting area before and after a shot is fired.

"(4) The permissible explosive must be one showing toxic gas emission that will place it in either class A or class B."

Old Timers Rewarded

One hundred and twenty-one employes of the Tennessee, Coal, Iron and Railroad Company were recently given recognition and awarded service medals, for a total of 3,365 years of service. This company is a subsidiary of the U. S. Steel Corporation, with headquarters in Birmingham.

Heading the list of those receiving awards was S. A. Stephens, of the Ensley works, with 45 years of service. There were four others with 40-year records, 18 with 35 years, 16 with 30 years, and 77 with 25 years.

Model Village for Miners

The Alabama Power Company, generators and distributors of electricity in the state, produce most of their electricity by water power, but they have one steam plant, which is located at Gorgas, on the Warrior River. They own and operate a coal mine, located near the steam plant, and have recently announced their intention to construct a model village in a picturesque setting near the mine for the benefit of their employes. Each of the houses will have all modern conveniences and will occupy a plot of approximately one acre. The new community will give city advantages in a rural setting.

Old Shelby Mine Resumes

The old Shelby iron ore mines, located about 40 miles from Birmingham, inactive for more than 25 years, have been re-opened, and are being operated by the Shelby Sand and Ore Co., by methods entirely different from that formerly used at the pits. The new operation uses hydraulic equipment to wash down the pit walls and collects sand for concrete purposes.

The deposit is located in an area covered by Tuscaloosa drift and the formation consists of sand and layers of clay. This material is flushed into a large classifier to recover the sand. Underlying the sand formation is a certain amount of brown iron ore which the operators expect to recover when sand operations are exhausted. It is planned to use a log washer and recover by methods generally used in the district.

Ensley No. 5 Furnace Down

Blast Furnace No. 5, at Ensley Steel Works, of the Tennessee, Coal, Iron and Railroad Co., has been blown out, for re-building above the mantle. The company expects to have it back in production in about 30 days. In the meantime, the five remaining stacks will continue to operate, as well as the three at Fairfield.

New Ogg Run Valley Mine in Perry County

A new coal mining operation centering on 640 acres in Ogg Run Valley is being made ready in the Hocking Valley-Roseville Crooksville area of Perry County, Ohio. This is the most recent development of Earl J. Jones and will cover more than 14,000 acres of virgin high coal.

Miners are being hired and construction of four slopes is reported underway. Initial production planned is 1,200 tons per day with later increase to 6,000. The company has the needed machinery ready. The Ohio Power Co. is completing a 69,000 volt line to serve the new operation.

There will be eleven new buildings including a large wash house for the 1,000 miners which the operation expects to employ at as early a date as possible.

PETER F. LOFTUS
Consulting Engineers
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Central States

Transport Iron Ore in Winter!

On January 6 the new $10,000,000 Coast Guard icebreaker "Mackinaw" demonstrated its capabilities of keeping lake traffic open during the winter. The icebreaker convoyed four Maritime Commission freighters through the St. Mary's River below Sault St. Marie. These freighters, built at Duluth, were brought as far as the Sault by the ice-cutter "Chaparral" which encountered only an 8-in. thickness of ice through White Fish Bay in Lake Superior. During its trip up the river from Lake Huron, the Mackinaw broke ice 12 in. thick, plowing through sections where the ice was windrowed to a 7-ft. thickness as reported by her commander, Edwin J. Rowland. This is the first time in the history of Great Lakes transportation that the shipping lanes have been opened in January.

Exploration Near Norway

The Summit Lake Iron Company, a subsidiary of Pickands Mather and Company, is doing exploration work in the Pine Creek district, four and a half miles northwest of Norway, Mich. It is reported that three new test holes will be sunk in an attempt to locate new iron ore deposits on state owned lands, which have been leased for this purpose. E. J. Longyear Company, of Minneapolis, has the drilling contract, with work under the supervision of H. J. Richards, superintendent for Pickands Mather and Company in the area. Three holes have already been sunk on the property but these were limited to surface drilling and did not reveal ore. Proposed depth of holes has not been announced as decision on this will not be reached except as the drilling program proceeds.

New Conveyor Belt

It is reported that a second steel-cable conveyor belt for the mining of iron ore will soon be installed by the Goodyear Tire & Rubber Company. It will be placed at the Gross Marble mine near Marble, Minn. The first steel-cable conveyor belt in an iron mine was set up at the Morris mine at Hibbing over a year ago. Both mines are operated by the Oliver Iron Mining Company.

At the Gross Marble mine ore will be lifted 257 ft. at an angle of 13½ degrees. The belt at the Morris lifts the ore 249 ft. at the same angle.

The new belt will complete the ore lifting task in one continuous operation, obviating the one, two or three transfers from individual belts which would have been necessary with the old type of conventional cotton fabric or cotton cord belt construction.

Although no thicker than a conveyor belt with six plies of fabric, the new belt's strength is actually the equivalent of 14 such plies.

Parallel steel cable carcasses in conveyor belts permit a maximum of troughing in each belt's load-carrying center and simplify training of the belt.

Annual Mining Symposium

The annual mining symposium which took place this year on January 16 and 17 at the University of Minnesota stressed the possibilities of mining and preparation of concentrates from the enormous low-grade taconite deposits of the Mesabi Iron Range.

Stephen Royce, of Crystal Falls, Mich., gave the geologist's viewpoint regarding the future of the taconite on the Mesabi. While engineers assume that this range could be a source of 60,000,000 tons of iron concentrates a year, it would require 200,000,000 tons of taconite mining to produce this tonnage. Concentration ratio will be about 3 to 1. Dr. John W. Gruner, professor of geology of the University, classified the various taconite horizons and showed that the bottom 30 ft. of the formation is beyond any economic good as it will require too fine grinding. The best horizons are higher up in the Biwabik iron formation. Professor Frank F. Grout, head of the State Geological Survey, presented many interesting observations gathered from his long association with the Biwabik formation.

R. D. Nolan, state director of lands and minerals, reviewed the history of the state and its land holdings. As sections 16 and 36 of all townships, through congressional action, are a source of state school support, the state has huge fee interests on the Mesabi range which it leases to mine operators on a royalty basis. The state also controls lake bed leases such as the Syracuse, east of Biwabik, now an active mining operation and the Rabbit Lake lease near Crosby on the Cuyuna Range.

R. W. Whitney, manager for Butler

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Brothers, revealed the impressive size of future plants, equipment and methods of operation of taconite mining necessary to invade the huge reserves of taconite. He stressed the use of large blast holes and proper equipment to drill them and visualized ore concentration plants with capacities as high as 900 tons per hour.

O. H. Johnson, vice president of the Mine & Smelter Supply Co., Denver, Colo., spoke on rod and ball mills for grinding. He brought out points of interest in some of the large fine grinding operations in the mining world and noted the trends towards larger diameter equipment. M. S. Morgan, of Arthur G. McKee Co., of Cleveland, Ohio, read a paper, "Agglomeration of Ores," covering the art of massing materials together by sintering and nodulizing which is a natural corollary to fine grinding. He especially stressed sintering plants for agglomeration of iron ores and noted advance in the art due to increased activity in New York, New Jersey, and Pennsylvania. The trend of the times is to make a harder sinter which can be handled with less shipping loss.

While the processing of the taconite appears to be well understood, what happens in the future appears to be a matter of economics. Large reserves of low-grade iron ore are found elsewhere in the United States as well as on the Mesabi Range. State tax policies will enter heavily into the forecast of the future and unless properly handled, can be expected to nullify any scientific advances conceivable to the state's mining engineers.

ZINC INSTITUTE CANCELS MEETING

The annual convention of the American Zinc Institute, which is generally held in St. Louis in April, will not take place this year. This is in cooperation with the new regulations and the effort of Washington authorities to conserve transportation and hotel accommodations. Last year 260 persons, from all parts of the country, attended this meeting.

It is expected that meetings of active members and Directors will be held in New York during the month of April to comply with the By-Laws, but such meetings will deal only with the necessary legal formalities and will call for a very limited attendance.

Report Rich Zinc-Lead Strike

A churn drilling project, being conducted by the U. S. Bureau of Mines on the 145 acres of mining land leased to Tom Phelps, of Joplin, by the Rex Mining and Smelting Company, has revealed rich zinc-lead ore in several places. At least four of the 11 holes drilled under the supervision of L. C. Brichta, project engineer, have disclosed exceptionally rich ore. Drilling has been taking place just east and south of two shafts opened by Phelps on this same tract several years ago.

It is reported that an operating company (The Eureka Products Co., Inc.) has been organized to go ahead with mine development work. Associated with Tom Phelps in the company are C. C. Madison, P. L. Madison, and Royal C. Jackson, of Kansas City; Armin F. Raebel, of East Hartford, Conn., and Jesse Atherton, of Joplin. Plans are reported under way to sink a new shaft between two of the drill holes which showed the most promising returns. Hoisting equipment is available in the derricks built over shafts sunk during previous operatins. There is a 6-in. Fairbanks-Morse pump on the job, powered by a Diesel engine, as well as a 350-cu.-ft.-per-min. Chicago Pneumatic compressor. It is proposed to truck the ore to Chitwood once mining operations get under way.

Underground Dozers at Oronogo

It is reported that Fenix and Sons have introduced bulldozers underground at the Oronogo mine in conjunction with a crawler mounted loader. It is said that the loader fills a 4-ton truck in less than 2 minutes making two scoops of 2 tons each and loading into a truck. The loader is 15 tons in weight and has a scoop 6 ft. wide and has been in operation underground for several months.

The bulldozer was introduced early in February and supplements the loader in making large tonnages available for easy and quick loading. It moves the ore into piles 5 or 6 ft. high to be scooped up by the front-end loader and placed in underground haulage trucks. These trucks haul the ore to an underground hopper from which it is subsequently drawn into cans for hoisting. Favorable ventilation conditions for this type of operation are brought about through connection of the workings with the famous Oronogo Circle open pit mine. It is also reported that one major company in the district is experimenting with Diesel type engines and the exhaust gases therefrom in an effort to avail themselves of this cheap mobile power for handling larger tonnages underground at lower costs in the absence of sufficient manpower. No details are as yet available on the progress of this investigation.

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Illinois Coal Operators Elect

At the fifteenth Annual Meeting of the Illinois Coal Operators Association held in Chicago recently the following were elected as members of the Executive Board until the next Annual Meeting, or until their successors are duly elected:

Executive Board: D. W. Buchanan, J. R. Browning, D. H. Devonald, George B. Harrington, Hubert E. Howard, E. R. Keeler, T. C. Mullins, T. J. Thomas, A. H. Truax, Wm. P. Young.

Treasurer: C. W. Peterson.

Immediately following the close of the meeting the Executive Board met and elected the following officers and general counsel for the ensuing year:

President, George F. Campbell; secretary, Fred S. Wilkey; general counsel, Essington, Beebe & Pratt.

A printed report of the proceedings of this Annual Meeting, which will include the reports of the officers and general counsel, will be mailed to members shortly.

New Coke Ovens at Indianapolis

The Wilputte Coke Oven Corporation, 40 Rector Street, New York, has been awarded a contract by Citizens Gas and Coke Utility, Indianapolis, Ind., for the construction of a battery of 47 Wilputte underjet — high and low burner — coke ovens and auxiliary equipment.

The ovens will be equipped with Wilputte standard self-sealing doors and hydraulic door handling machines and will be designed to be underfired with either coke oven gas or producer gas.

Included with the auxiliaries will be a gas producer plant which will include three 10-ft. Semet-Solvay automatic gas producers, waste heat boilers and conditioning equipment.

The Wilputte Company has built 682 underjet high and low burner by-product coke ovens (twelve batteries) with a total annual coal capacity of 5,951,900 tons during the war to meet the needs of the metallurgical industry. These have been put into operation at Morgantown, W. Va.; Ironton, Ohio; Chattanooga, Tenn.; Lackawanna, N. Y.; Gary, Ind.; Warren, Ohio; Gadsden, Ala.; South Chicago, Ill., and Erie, Pa.

Mining Engineers for Korea

Dr. Syngman Rhee, first President of the Provisional Government of the Republic of Korea, has announced the appointment of Samuel H. Dolbear as Mineral Adviser to that country.

Korea has been assured by the joint declaration of the United States, China and Great Britain of its ultimate independence.

Mineral production in Korea includes gold, silver, coal, iron ore (pig iron and steel), salt, Portland cement, clay and clay products, graphite, copper, lead, zinc, tungsten, magnesite, aluminum, barytes, fluorspar, mercury and molybdenum.

When the Japanese have been driven from Korea, a large number of mining engineers and metallurgists will be required to assist in the rehabilitation, development and operation of the numerous mineral industries which, according to Japanese statistics, employ around 220,000 men.

Mr. Dolbear is particularly anxious to reach mining engineers who have had previous experience in Korea to assist in formulating a program and later in actual operation. They are requested to communicate with Mr. Dolbear at 11 Broadway, New York 4, N. Y.

Hanna Coal Company

St. Clairsville, Ohio

FOR SALE

9—612 AB Goodman Shortwall Mining Machines—Manual Controller—35 HP, 500 Volt Motor—7½' Cutter Arm.

8—10-Ton Locomotives (Baldwin Westinghouse) Sleeve Bearings throughout—R-22-B Controllers—Type 75 Motors, 42" Gauge. Edge wound (GE) resistance. Cast Iron Outside Frames—Journals 4" in diameter, 6" in length.

2—Heyl and Patterson Stone Larries—10-Ton Capacity Standard railroad gauge—180 degree stacking table and chain—500 Volt Motors—G.E. Controller. One machine has just recently been rebuilt and is in excellent condition.

1—Novalux Street Lighting System—25 Light Fixtures. All of the necessary poles, wire, stubs, pins, transformers, switches and disconnects.

1—Heyl & Patterson Tipple—300 Tons per hour feed—72" Picking Table 22 ft. long—Double Deck Shaker Screen—24 x 36 Crusher—2 Loading Booms 42" wide—30" Cross Conveyor Belt—House Coal Bin.

2—200 KW 333 DC Amp. 600 Volt, 6 Phase Convertors with Transformers (single unit)—Manually operated Switch-gear—with extra rotor.

4—Car Feeders (mine cars)—Specifications upon request.

2—Rotary Dumps (complete cycle)—Timer operated.

50—500 Volt DC Motors HP Range 5-60—Speed Range 900 to 1,750 R.P.M.

221—Wheat Mine Lamps with M.G. Set and Racks.

250—Edison Lamps with Resistance Chargers and Lamp Racks.

2—Mining Safety Device Company Semi-Portable Car Hauls.

(ALL OFFERED SUBJECT TO PRIOR SALE)

Women of U. S. Steel

A total of 40,000 women now are employed by United States Steel Corporation and its subsidiaries, *U. S. Steel News* disclosed in its January issue released recently. Fifteen thousand are in office occupations and 25,000 directly engaged in production.

The January issue of the corporation's employe magazine is dedicated to the "All American" girls who have entered the steel industry to fill the places vacated by brothers, husbands or sweethearts in the armed forces. Photographs of over a hundred girls are shown.

Speaking of contributions of women employes to U. S. Steel's production achievements, Irving S. Olds, chairman of the Board of Directors, said, "Women have played an increasingly important part in steel production since the beginning of the national emergency. Before Pearl Harbor, steel-making was considered a trade for men, and most of the women employed in the industry were in clerical positions. Today, however, they are doing excellent work in mill jobs and are to be congratulated for their part in producing steel for victory."

Typical of the women employes is the "cover girl," Sophie Wolansky, a machine operator in the tool room of the ordnance department, of the Farrell, Pa., works of Carnegie-Illinois Steel Corporation, U. S. Steel subsidiary. Miss Wolansky started at the plant in 1943, when her brother, Max, a machine operator, left to enter the Army. Today she operates many of the same machines that he did. Miss Wolansky has four brothers in the armed services and a fifth is preparing to go.

The Japs are "Copycats"

The Japs are copycats and mediocre in their workmanship, but, unpressed by the need for metal conservation, they can afford to lag in design and to accept inferior standards in the production of their war matériel, American metallurgists have found.

Metallurgical examination of captured enemy war matériel reveals that the Japs are using an abundance of the vital alloying metals, indicating that they had adequate sources or stockpiles of these necessary ingredients of war at the time the products were made. Thus, unpressed by the need for conservation of materials, the Japs have not been driven to exhibit much brilliance and originality of design.

German war matériel, on the other hand, shows definite shortages of some metals, and many of the new materials, processes, and designs which the Germans originate are answers to shortages in critical materials.

Jap workmanship is consistently mediocre, metallurgists state, but generally adequate for the purpose intended. German craftsmanship is just as consistently good.

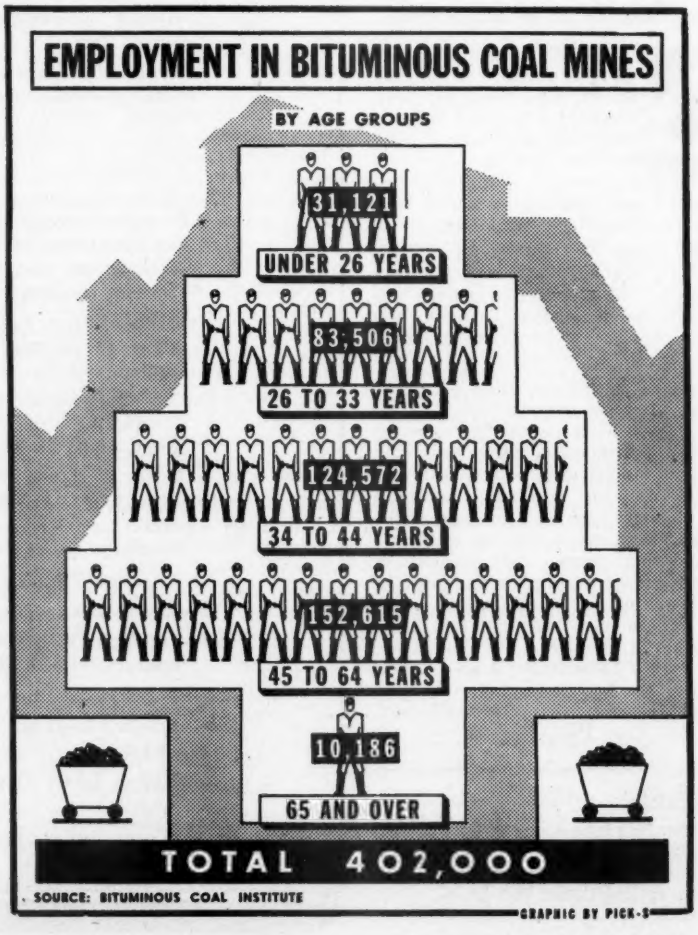
This information is gleaned from a recent report prepared by metallurgists of Battelle Institute, Columbus, Ohio, as the result of studies they have been making for the Army Ordnance and U. S. Navy Departments for the Office of Scientific Research and Development. Numerous other research laboratories cooperated with Battelle in various phases of the investigation.

The best use for captured enemy materiel is to turn it immediately against the enemy to hoist him with his own petard. To make this possible, officers and men are familiarized with the design and operation of enemy guns at the Aberdeen Proving Ground, where enemy arms are collected. These experts are scattered through the forces in the field, prepared to instruct field forces in the operation of captured guns.

Next in order of importance is the study of captured materiel as to capabilities and limitations, so that proper defense can be opposed to it and so that any useful kinks in design, method of manufacture, or materials used may be promptly noted and utilized. Following come studies of the materials from which the enemy equipment has been made. These reveal enemy weaknesses and are extremely valuable to the Army, Navy, and the Foreign Economic Administration.

An enemy shift from one raw material to another, or from one method of production to another may disclose his shortages in materials or production equipment and thus show up bottlenecks whose further restriction by military or economic action will hurt him most.

Germany is the enemy who has felt the pinch in vital war metals. It is generally considered that the Nazis are cramped for copper, nickel, molybdenum, vanadium, tungsten, chromium, and manganese, the severity of the shortages being about in the order named.



Western States

California Gulch Mill Operations Retarded

COLO.

Due to labor shortage and scarcity of truck facilities, the California Gulch Milling Company of Leadville, Colo., was not able to operate its 100-ton No. 1 mill during the latter part of 1944. Its 500-ton No. 2 mill, however, was able to operate. The company produces a lead-copper concentrate which is shipped to the Arkansas Valley smelter as well as a zinc concentrate which is shipped to a Utah smelter. Ore for the mill comes from the Ibex and Colonel Sellers dumps. S. L. Harner is general manager Leadville, L. S. Harner is chief engineer, and Pete Kaufman is mill superintendent.

Production Comes First at Climax

With a force less than at any time since 1932 and in the face of an extremely acute labor shortage, all employes at Climax were placed on production during 1944 and development work discontinued altogether. During the year the Climax Molybdenum Company mined and milled 3,420,338 tons of ore.

Operations are on a seven-day-a-week basis; time and a half is paid for the sixth day and double time for the seventh day. Peculiarly enough and undoubtedly due to a well-conceived accident prevention program, the company reports the best safety record in its history in spite of heavy labor turnover and the employment of much inexperienced labor.

Munitions from Geneva

UTAH

Manufacture of steel to be used in fabricating 8-in. shells was begun recently by Geneva Steel Company, after the Army ordnance had approved samples produced on an experimental basis.

Although 13,000 tons of the shell steel is being called for by the Army per month from Geneva, officials do not expect to be able to produce more than 10,000 tons per month at present.

Approximately 50,000 tons of ship plates and structural shapes are now being produced monthly at the plant, but this volume will be curtailed to produce 10,000 tons of shell steel.

Wanted—Lead Production

The Tooele smelter of the International Smelting and Refining Company is faced with the most critical labor shortage in its history, according to company officials.

Operating personnel has gradually dwindled, and while doubling of shifts has bridged some gaps, this method now ceases to meet the situation. Curtailment of production in the face of a serious lead shortage is the stern outlook at the plant, as well as others, unless immediate relief is obtained.

Chief Consolidated Production

Production at the Chief Consolidated Mining Company properties in the Tintic district is being maintained at the rate of between 7,000 and 7,500 tons of lead-zinc ore per month, according to company officials.

All the production is being mined between the 2,200 and 2,250-ft. levels of the old Chief No. 1 mine, which was reopened last year.

Adversities Revealed in Production Report

ARIZ.

A valuation of $112,209,-100, 7 percent lower than for the previous year, has been placed on 1944 Arizona metal production by the U. S. Bureau of Mines.

A total of 116,500 fine ounces of gold was mined at a valuation of $4,-077,500; 4,464,000 fine ounces of silver at $3,174,400; 716,500,000 pounds of copper at $96,011,000; 33,000,000 pounds of lead at $2,607,000, and 56,-600,000 pounds of zinc at $6,339,200.

Copper production reached its highest monthly rate, about 72,500,000 pounds, in March, and dropped to its lowest, about 45,700,000 in November, it was reported; the drop due largely to the acute labor shortage in the state.

Metal production in Arizona during 1944 was featured by the following, the Federal Bureau of Mines reported:

Increased capacity of the copper concentrator and smelter at Morenci from 25,000 to 45,000 tons of ore daily; the large output of zinc-lead ore from the Copper Queen mine at Bisbee and the San Xavier mine south of Tucson; loss of 4,090,000 pounds of copper monthly in production during the last quarter of the year at the Inspiration Consolidated Copper Company because of the destruction by fire of its electrolytic plant; destruction

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by fire of the shaft, ore bins, crushing unit and other facilities of the Mammoth-St. Anthony property at Tiger; suspension of operations at the Duquesne zinc-lead mine near Patagonia, and the closing of the zinc-lead property of the Tennessee-Schuylkill Corporation, at Chloride.

Following a thorough overhaul, the mill of the Tennessee-Schuylkill Corporation at Chloride again is in operation. A fine grade of zinc-lead ore is now coming from the 1,200-ft. level of the mine, according to reports. Work of the mill and mine was suspended last year.

Tax Adjustment Denied

Proposed adjustment by the Arizona Tax Commission of the Phelps Dodge Corporation 1940-41-42 additional income tax levy from $204,525.32 to $37,544.99 has been ruled illegal by the Arizona attorney general, John L. Sullivan. The move is prohibited by law since the "payments for 1940 and 1941 were made by the (mining) company on the voluntary basis without compulsion from the commission, and accepted by the commission as valid assessments," the attorney general ruled. Arizona law prohibits the state tax commission from refunding amounts in excess of $1,000 without court order, he said.

Pending Mine Legislation

The New Mexico legislature now in session is considering bills relating to safety regulations and mine inspection and also to broaden the provisions of the workmen's compensation law now on the statute books. Mining, New Mexico's principal industry, is represented by the New Mexico Miners and Prospectors Association, headed by Horace Moses as president. Mr. Moses is the general manager of Chino Mines Division, Kennecott Copper Corporation.

Production High at Chino

Capacity production is being maintained by Chino Mines Division, Kennecott Copper Corporation, at its mine at Santa Rita, and mill and smelter at Hurley. Horace Moses, general manager, has been called upon by Lieutenant General W. D. Styler, U. S. Army, commanding ASF, Washington, and by Vice Admiral S. M. Robinson, U. S. Navy, for all-out production to meet the increasing demands of war for copper.

American Zinc Exploration

Extensive diamond drilling operations are being carried on in the Central Mining District, Grant County, by the American Zinc, Lead & Smelting Company, of Joplin, Mo. In charge of the operations on the Three Brothers Mining Company property is William F. Netzeband, engineer and geologist, of Joplin.

Fluorspar Prospecting

In preparation for a drilling project on the Valery fluorite property northeast of Imlay, Pershing County, Nev., the Nevada division of the United States Bureau of Mines under direction of Glenn L. Allen, has been conducting geological surveys and surface stripping with bulldozers. As soon as crews and equipment are available the Valery deposit and that of the Daisy mine near Beatty, are to be drilled.

Both deposits are reported to be of a high grade and of great magnitude. It is indicated the Pershing County deposit contains much fluorspar of acid grade, a product urgently needed in making war munitions. The Valery property is said to have been recently purchased from the original owners by Richard T. Hamilton, of Lovelock, in association with several Oakland, Calif., men. Engineers of the Army Ordnance Division have sampled the deposit and have expressed keen interest in its possibilities as a source of acid-grade fluorspar. Surface development is said to have established its length at about 1,500 ft. and its width at 150 ft. It is not known whether it is a deep or only a surface deposit. The drilling is expected to reveal its depth.

Lone Mountain Zinc

Development work by means of diamond drilling which has been going on on a substantial scale at the Lone Mountain Zinc property north of the old camp at Eureka, has been discontinued. The U. S. Smelting, Refining and Mining Company took an option on the property several months ago from Eureka mining men. Suspension of the work is understood to be

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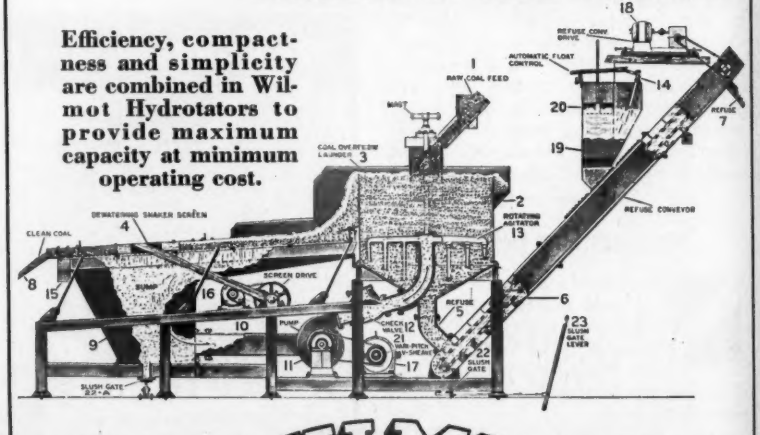

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HYDROTATOR *Preparation* EQUIPMENT

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only temporary, due to bad weather; it will be resumed in the spring.

More Activity at BMI

It is reported from Las Vegas that engineers for the Rheem Manufacturing Company have arrived and are prepared to start work on readying buildings at Basic Magnesium for production of rocket projectiles for the Navy and mortar shell castings for the Army. Former BMI buildings have been cleared of machinery and equipment and manufacturing is expected to start very shortly.

New Ore at Majuba Hill

It is reported that a new source of ore has been found in the Majuba Hill mine by a cross-cut driven from the middle tunnel. The mine is near Imlay and is operated by Greenan and Kerr of Reno. Shipments from this area average 60 to 70 tons per car and are being sent to the Garfield smelter in Utah. Copper ore so far delivered to smelters (some 25,000 tons) is said to carry 4 percent copper, a small amount of silver, and has yielded more than a ton of tin.

Bostona Installs Flotation Equipment

The Bostona Mines Company, according to reports, will soon install additional flotation equipment in the 400-ton flotation plant with production expected to start in the spring. The company was organized in the summer of 1944, and operates the Boston-Montana Mine in the Elkhorn district near Wise River. A total of 15 men is now employed on the company's property. Repair work is going on preparatory to full scale production at the mine and a 50,000-volt power line, 25 miles long, is being built. The ore carries values in gold, silver, copper, lead and zinc. Jacob Salar is president of the company, B. A. Risley is secretary and William R. Allen occupies the position of general manager and chairman of the board.

Cumberland Shaft Being Unwatered

Unwatering operations are being conducted in the main shaft of the Cumberland silver-lead mine as it prepares for deeper mining. Some ore was moved from the surface during the past year's operation. Clarence Oliphant, Orval Thomas, H. E. Johnson, J. W. Stack, and R. M. Perry, of Cut Bank, Mont., are working the property under lease from Russell and Clara Manger, of White Sulphur Springs, Mont., owners. The mine is an old one, having produced high-grade lead and silver ore from 1889 to 1892, after which the pumps were pulled and the workings allowed to fill with water. Low silver prices, and inadequate transportation facilities have kept the mine on the inactive list for a long time.

Bunker Hill Declares Dividend

Bunker Hill & Sullivan Mining & Concentrating Company has declared its first 1945 dividend of 12½ cents per share, totaling $163,500 and payable March 3 to stockholders of record February 16. This brings the company's total dividend record to $59,404,741. In 1943, the company paid 25 cents a share, or

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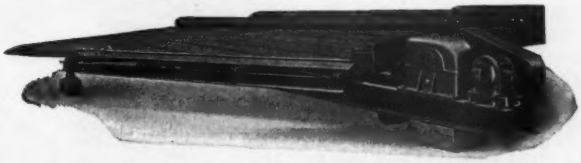

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a total of $1,308,000, but in 1944 the rate was dropped to 12½ cents per share and totaled $654,000. The cut was due entirely to the shortage of available labor. The Bunker Hill is now installing a new addition to its lead smelter at Kellogg for the recovery of cadmium metal from smelter flue dust. Recently the company installed a million dollar zinc fuming plant for the recovery of zinc from smelter slag. Bunker Hill is the only mining company in the Western states that mines, mills, smelts, refines and markets its own mineral products, which now include gold, silver, lead, zinc, antimony, bismuth and cadmium.

Bradley Buys Tungsten Property

The Bradley Mining Company, operators of the largest tungsten producing mine in the U. S. at Stibnite in the Yellow Pine district of south Central Idaho, has bought the tungsten mining property of the Ima Mines Corporation at Patterson, in Lemhi County, on the Salmon River. Prior to the discovery of the Yellow Pine mine the Ima was the largest Western producer of antimony. These mines produce 75 percent of the tungsten mined in the U. S. In addition to tungsten, the Yellow Pine mine produces by-products of gold and antimony, while the Ima mine produces by-products of lead, silver and copper. J. A. Mecia, former manager of the Bradley operations at Yellow Pine, is now in charge of the Ima mine.

New Copper-Gold Mill Completed

Pioneer-Lilyama Mines recently completed and put into operation a 250-ton flotation mill to handle copper-gold ore. The Lilyama Mine is located in the Pilot Hill district of Eldorado County, Calif., and is being operated under lease from the Volo Mining Company. Volo Associates was formerly the operating name for Pioneer-Lilyama Mines, the owners of which are Mrs. Freda McGill, of Placerville; E. L. Reeves, chief mining engineer and geologist, also of Placerville, and O. H. Griggs, Placerville, general manager. H. Rosborough, of Columa, Calif., is general superintendent.

Drilling Started at Williams Mine

A drilling program has been started at the old Williams mine in Nevada County, six miles southwest of Grass Valley, Calif. The American Smelting and Refining Company has given the drilling contract to the Sullivan Machinery Company. Principal values at the mine, which comprises some 600 acres, are in lead and in silver. Considerable development work has been completed including a 150-ft. tunnel and an access road to the property. J. D. Mackenzie, of San Francisco, is general manager of the California operation.

Trentwood Aluminum Operation

The Trentwood Rolling Mill of the Aluminum Company of America is operating at 85 percent capacity as compared to the 50 percent of recent months. There are now about 2,500 persons employed with jobs available for 300 more if they could be obtained. The sheet mill has stepped up production to fill Government orders, thus necessitating increased output from the company's aluminum production plant at Meade, Wash. J. P. Haight is manager at Trentwood, and W. N. Farquhar is manager at Meade. In a later issue, the alumina-from-clay plant at Salem, Oreg., will be described. This important venture is expected to have considerable bearing on the future of the Pacific Northwest.

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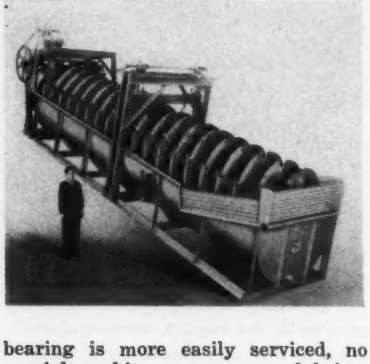
MANUFACTURERS FORUM

New Cross-Flow Classifier

Denver Equipment Company has just announced its new cross-flow classifier, developed in its ore testing laboratories and installations in several milling plants. The classifier derives its name from the "cross-flow" principle of operation. The overflow weir is on the side opposite the feed, rather than on the end of the classifier; the conveyor flights are in line with the direction of pulp flow across the classifier. These features are said to permit an uninterrupted, smooth flow of pulp across the classifier from feed entrance to overflow weir.

The cross-flow classifier eliminates the submerged bearing commonly used in "spiral" type classifiers. The lower bearing is placed somewhat below the middle of the shaft, but above the maximum pulp level. Thus, the



bearing is more easily serviced, no special packing or pressure lubrication is required, and danger of bearing trouble from sandy pulp is said to be eliminated.

The classifier is made in 11 simplex sizes from 6 in. to 60 in. and seven duplex sizes from 24 in. to 60 in.

Bulletin C5C-B discusses the basic principle of surface current classification and how it is applied in mechanical classifiers. Complete specifications and dimension drawings are given for each size classifier. Also, much data helpful to anyone interested in classification are included, such as: classifier applications, installation and operating notes, and how to select the proper size classifier for a particular problem.

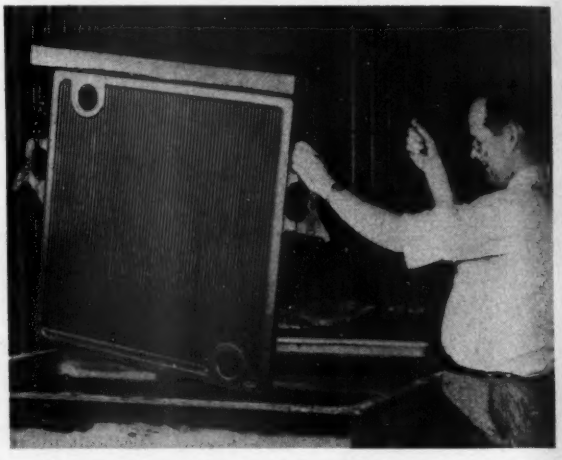
A copy may be obtained by writing to the company, P. O. Box 5268, Denver 17, Colo.

Latex Coated Metals

Post-war demands for synthetic latex coated metals are expected to increase in volume as civilian manufacturing is resumed. This method of insulating and coating metals of intricate shapes without the use of molds and dies was developed by United States Rubber Company prior to the war. It was adopted to eliminate the effects of abrasion and rust as well as acid and alkali corrosion and provides a cushioned and nonslip surface for hard metal. Its use in war industries has accounted for increased production of many necessary materials and it has made possible the replacement of valuable machine parts no longer available.

Applications of latex to metal have been applied to filter-press plates, rayon mass tubes, airplane and auto steering wheels, marine lamp guards, submarine and naval equipment, perforated plates for airplane cooling systems, grab rails, nuts, bolts and hundreds of other items.

These are being covered with a required thickness of latex made from several types of synthetics. Neoprene and buna S have been found to be highly satisfactory.



500-lb. filter press plate in process of being given complete coat of synthetic rubber to make it acid resistant

In addition to the resistance which this rubber coating gives against corrosive elements, it has been invaluable wherever the possibility of static or spark would cause either explosion, fire or shock.

New Gas Engine Design

A discovery in the Diesel engine field, which reportedly will enable the engine operator to use either gas or oil as fuel without any electrical sparking device, and which is said to cut fuel consumption of gas engines by from 20 to 25 percent, has been revealed by Ralph L. Boyer, chief engineer, of The Cooper-Bessemer Corporation. The new engine is the result of long experimentation. Recently efforts have been rewarded by the successful operation of a natural gas engine on the diesel principle, enabling the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas, and refinery by-products.

The conversion from liquid to gas fuel is as simple as the closing of one valve and the opening of another with the engine operating continuously at full load according to Mr. Boyer. In the past it has always been necessary to shut down and exchange major or minor parts of the engine.

The new principle permits the same fuel economy regardless of fuel type. It raises the normal 25 percent thermo-efficiency of the gas engine to the 35 percent thermo-efficiency common in diesel oil engines.

If this discovery had obtained prior to the gas shortage, curtailment of considerable war production might have been avoided.

Cooper-Bessemer already has the new engines in production.

Unit Charger for Flashlights

A single unit charger for its recently introduced rechargeable wet flashlight storage battery which can be operated from the ignition system of automobiles, trucks, buses, tractors, boats, or airplanes, is announced by the B. F. Goodrich Company, Akron, Ohio.

The auto charger is said to assure a flashlight battery at top charge at all times in transport trucks, buses, police cars, automobiles, taxi cabs, fire trucks, ambulances, delivery and repair trucks and service cars, tractors, airplanes, and boats.

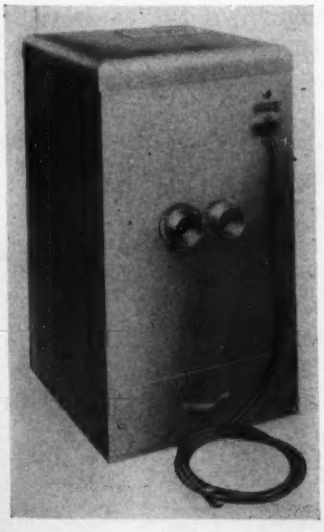
Designed for easy attachment on the dash, cowl, side panel, or several other convenient places on the vehicle the charger may be connected so that it does its work with the vehicle either running or idle. For charging while the vehicle is not in use it is attached to the "live" side of the ignition system. It operates on six volts and 12 volts, direct current.

When the battery is charging, a pilot light glows at the top, and a toggle switch at the side prevents danger of an overcharge while the battery is in the charger. Connecting wires are red and black so ignition wires can be correctly tapped.

New Ideal Dust Collector

A new unit type dust collector has been announced by the Ideal Commutator Dresser Company, 1963 Park Avenue, Sycamore, Ill.

Standard attachments are reported to simplify installation on grinders, buffers, sanders, polishers, lathes and other machines. Being compact in size it readily fits behind or beside machines as they stand. Relocation of machines, elaborate housing, separate rooms, expensive ducts, etc., are said to be unnecessary.



Five hundred cubic feet per minute is developed through the two inlets by a ¾-hp., 3,450 r.p.m. motor, driving a 7½-in. diameter by 2-in. wide squirrel cage blower wheel.

Dust laden air is drawn through the inlet pipes into twin cyclone separators. The dust particles drop down into the dust drawer and the lighter air passes on through a viscous coated filter where very fine dust is removed. Clean air is discharged back into the room. The two 3-in. diameter inlets can serve either one or two machines.

The filter consists of 20 layers of viscous coated filter paper. To restore the filter's efficiency after it becomes dirty, it is only necessary to peel off the first two layers. This can be done five times without affecting its cleaning ability. Under average conditions a filter is said to last a year or more.

Dimensions are 20 in. by 20 in. by 38 in. high. Shipping weight: 265 pounds.

New Electrode for Heavy Weldments

A new heavily covered arc-welding electrode for flat and horizontal filet welding as well as for flat butt welding has been announced by the electric welding division of the General Electric Company. Desirable wherever weld requirements include high mechanical properties, rigid X-ray examination, good profile, high deposition rate, and good surface appearance, the applications of this electrode are reported to include pressure vessels and pertinent connections, heavy machine bases, and structural parts such as column plates, columns, roof trusses, beams, and girders where the thickness of the section permits.

Known as Type W-27, the new electrode is said to be characterized by an exceptionally high melting rate which results in increased production and higher speeds at the same welding current as other electrodes. At comparable production speeds, Type W-27 requires less heat input to the joint, thus reducing warpage and internal cooling stresses. These features, plus its ability to operate through a wide range of current, and freedom from undercut, suggest the use of Type W-27 for a great many war production tasks. It is available in three sizes: 3/16 by 18 in., ¼ by 18, and 5/16 by 18 in., and is rated A. W. S. classes E-6020 and E-6030.

Announcements

The Inca Manufacturing Division of the Phelps Dodge Copper Products Corporation, Fort Wayne, Ind., has been awarded the Army-Navy "E" for the fifth time, Wylie Brown, president, announced recently.

Mr. Brown was notified of the honor by Admiral C. C. Bloch, chairman of the Navy Board for Production Awards. The flag with its four stars, signifying the fourth renewal, was granted to the plant for one year.

* * *

The Ohio Brass Company, Mansfield, Ohio, announces the removal of their San Francisco office to 1503 Hobart Building, 582 Market Street, San Francisco 4, Calif., effective immediately. This office is under the direction of A. M. Bohnert.

* * *

Lake Shore Engineering Company, Iron Mountain, Mich., announces opening of new sales offices in the Union Commerce Building, Cleveland 14, Ohio. Mr. J. M. Record will be district manager for Lake Shore in the Cleveland territory.

CATALOGS AND BULLETINS

SHEAVES — "ALCASTEEL," Bulletin No. A-396, *Vulcan Iron Works,* Wilkes-Barre, Pa. Describes and illustrates a wide variety of sheaves and sheave installations with much useful field application data. 23 pages.

COAL CRUSHERS AND BREAKERS, Bulletin No. 342, *McNally Pittsburg Mfg. Corp.,* Pittsburg, Kans. Many diagrams and illustrations of coal crushers and set-ups for a broad range of application. Tabulated capacity data and dimensions. 19 pages.

PNEUMATIC TOOLS, Form 117, *Ingersoll-Rand Co.,* 11 Broadway, New York 4, N. Y. Pocket size folder shows company's line of air tools and portable compressors. Though brief, it contains pertinent information on size ranges and model variations.

OFF-THE-HIGHWAY VEHICLES, New bulletin of *Linn Mfg. Corp.,* Morris, N. Y. Shows Haftrak and Catruk heavy duty vehicles for moving rock, coal, ore, etc., over very rough terrain, deep mud, snow, ice, etc. Printed in English, Spanish and Portugese.

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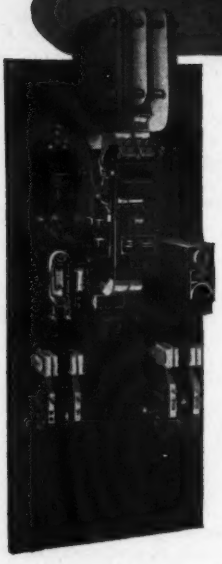

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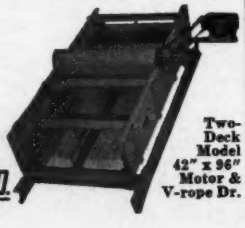

Two-Deck Model 42" x 96" Motor & V-rope Dr.

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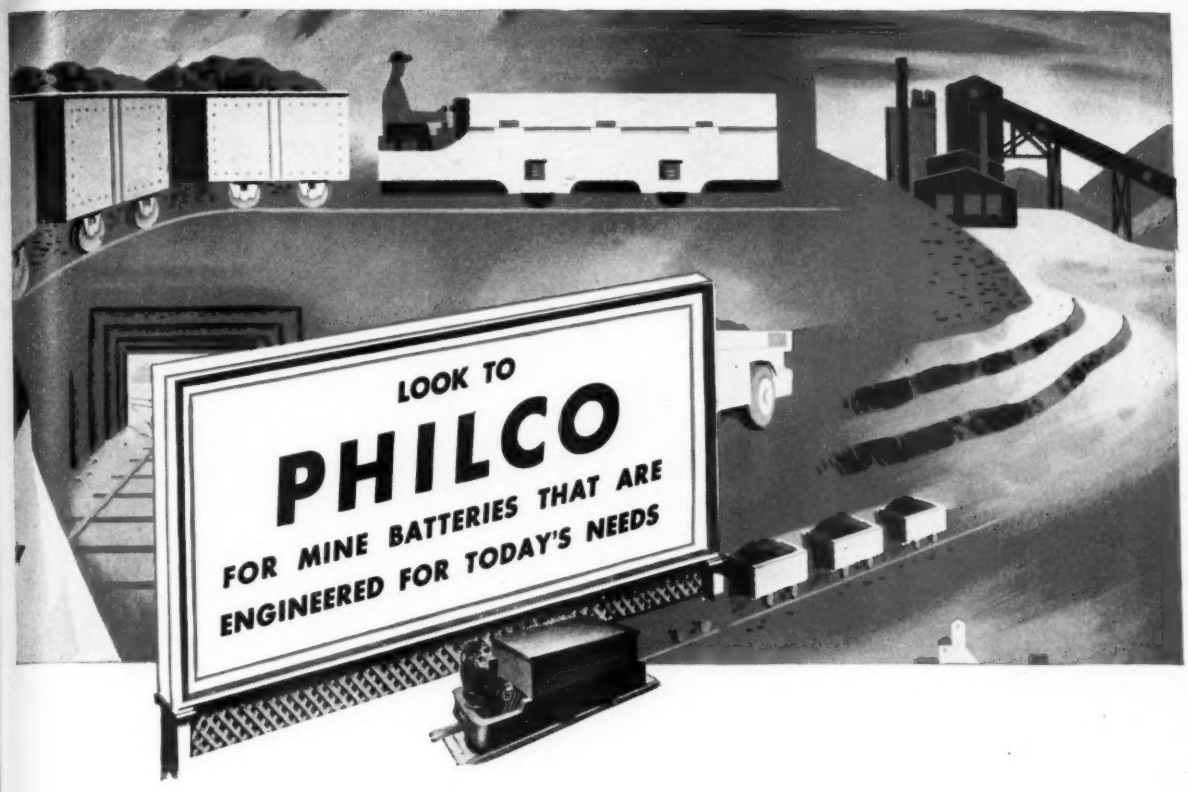

Consistently through the years, users of PHILCO Mine Batteries have been first to get the major developments contributing to high capacity, greater efficiency, longer life, lower cost. Newest example of Philco leadership in mine storage battery engineering is the new Philco "Thirty" with *30% longer life*—now available in certain types and limited quantities for mine locomotives and shuttle cars. Catalogs of this and other modern Philco Batteries for the special needs of mine operators will gladly be sent on request. Philco Corporation, *Storage Battery Division,* Trenton 7, New Jersey.

The new Philco "Thirty", with 30% longer life, is identified by its distinctive red top

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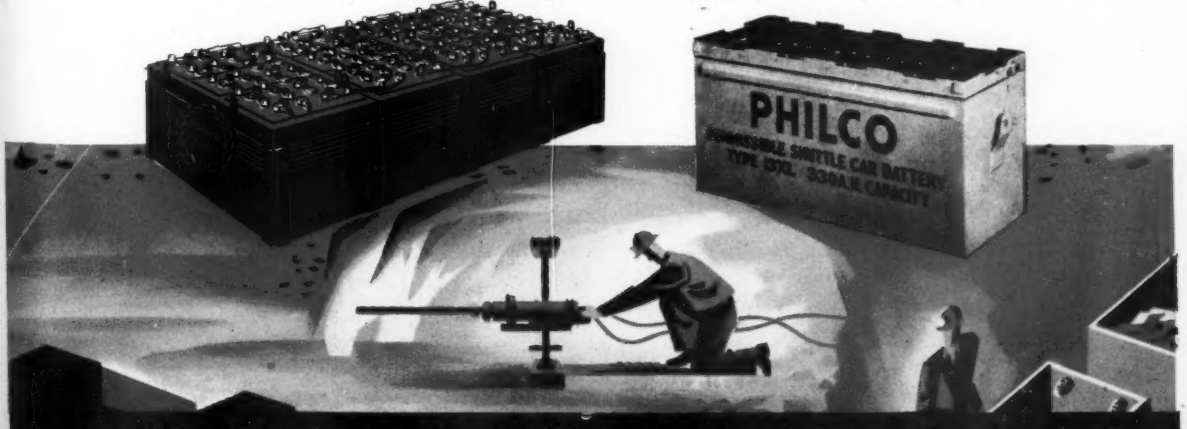

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The high productivity of America's mechanized mines is a tribute to efficient management—and to the highly-skilled workmen who man the machines. Vital to these miners are the safety factors of *better, more dependable light* and *proved head protection,* provided in top measure by the Edison Electric Cap Lamp and M.S.A. Comfo Cap—serving war's urgency in greater coal production, guarding the men on the job!

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